OCT 29 1934

ELECTRICAL WORLD

"There is very satisfactory evidence that the policies of the reorganized recovery administration will afford industry a satisfactory means of solving its own problems in a manner consistent with public policy.

"To industry it seems apparent that recovery in terms of employment is dependent upon expansion of industry, which, in turn, depends upon the confidence that industry may go ahead with prospects of fair profit. This seems essential for recovery of the durable goods industries. There seems definite evidence that the Recovery Board policy is sympathetic to this point of view."

FRANK C. JONES
President National Electrical Manufacturers Association

October 27
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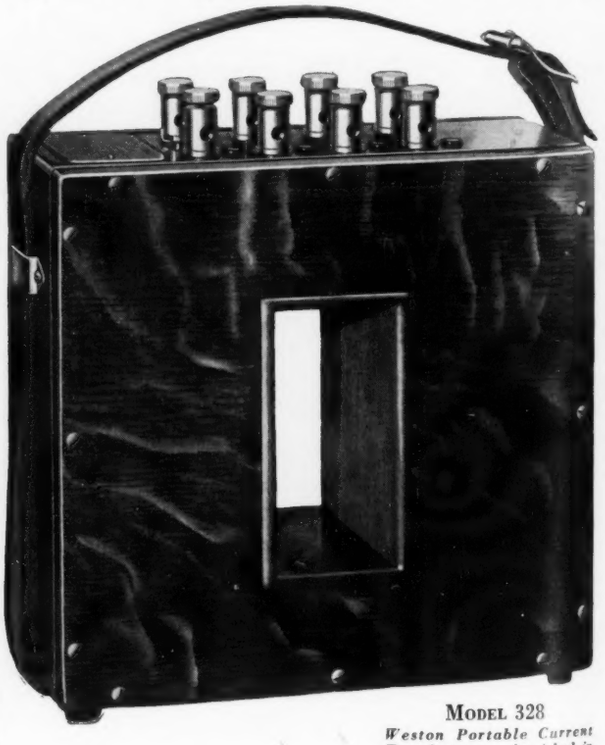

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THIS INDEX is merely a convenient guide. Many articles will appeal to several reader groups—many will apply to all. News and other departments are of general interest.

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PUBLISHED EVERY OTHER SATURDAY

OCTOBER 27, 1934

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Justified Optimism Rules

NO MORE hopeful and inspiring week has marked the electrical industry since the crash than the one just past, when the manufacturing and wholesaling groups both had their annual meetings, one in Chicago and the other in Detroit. From every side comes the story that business is materially bettering, that confidence has caught up with statistics and that the cash register's song is supplanting complaining and cursing.

More important for the long pull are the realization that practices are being composed, conflicting groups reconciled to full harmonious functioning and elements of friction definitely fading. This, fortunately, is true both within the manufacturing and distributing groups and of the relations between these two branches of the industry. No one who absorbed the inspiration and confidence of the two sessions can refute this interpretation of the tone in and out of the meetings—not even the minority that still has not experienced the tangible fruits of a profit system that is still working and still to be the foundation of American enterprise.

Even more significant than these indices is the evolution of a new leadership spirit. When the codes were thrust into the arena everything at first went haywire in organization and in objectives. Whether because of them or in spite of them and all the new realignments they entailed, the fact today is that a new harmony has gripped the component elements of the industry and new directive forces have been developed to cash in on the swing away from temporary disruption and toward smooth, co-ordinated effort. In this connection may be cited the ironing out of differences between the small and large distributors. What looked once like the beginning of a pitched battle between a rump parliament of independent distributors and the well-knit forces of the larger distributors has lately been superseded by a peace that bodes the best for both the producers and the buyers who sit on opposite flanks of the wholesalers. Naturally the distributors themselves are to benefit from this accord.

THE new tone so noticeable at the conventions of the National Electrical Manufacturers Association and the National Electrical Wholesalers Association seems nicely synchronized with the change in national business sentiment. Washington advices seem to indicate a return of the Administration to a more conservative attitude which is encouraging to business. And the statement of Francis M. Law, president of the American Bankers Association, on the eve of the association's annual convention, that now is the time to go ahead is tremendously significant. From this source a signal to go means as much as anything could at the present juncture to make the whole situation rosier than it has been.

Also significant is the new attitude toward NRA. In his address before the convention in Chicago incoming President Jones of N.E.M.A. said that he was convinced that NRA is being revised to grant industry more voice in policing itself. Add to that the fact that electrical trading, like a ripple heralding a wave, had already been picking up from quarters themselves inspired with a feeling of justified confidence. For a while this fact was not recognized, but it is now acknowledged that the figures are positively encouraging and safer to build on than fears. Leadership has arisen to keep this favorable trend from being a mere transitory phenomenon. All the situation now needs is the will to devise a nation-wide program to build acceleration into momentum.

CONTROL AIDS INDUSTRIAL PRODUCTION

New electrical controls are available for industrial plants. Groups of motors can be operated as a unit and with predetermined schedule. A battery of automatic cam grinders with special time-operated control is a case in point.

Optimism Sweeps N.E.M.A.

Reassurance on NRA Policies — Code Operation Discussed and Viewed Favorably — Swope Disagrees as to 30-Hour Week — McGraw Award to J. S. Tritle

OPTIMISM about business, favorable reaction to code operations and new and improved policies in management—these were the chief impressions gained from the Chicago meeting of the National Electrical Manufacturers Association. A thousand members met in a record-breaking convention to discuss mutual problems and to improve their operations under the code. As usual most of the time was devoted to product group meetings and only two general sessions were held.

At the opening meeting very reassuring information was given about the recovery administration's policies in Washington by J. S. Tritle and A. D. Whiteside. The address of President Tritle sounded the keynote for the entire meeting and gave the background for the optimistic industry picture.

Some high points in this talk are quoted in the following paragraphs:

"As you all know, the code signed by the President for this industry is a self-governing or autonomous code. It has given us the right to govern ourselves. We make our reports to Washington. The other day in Washington we were told we were running our code to the satisfaction of the government.

"At the time the code was submitted to Washington, in 1933, we made a survey of the industry and found only about four companies that were making any money. Since that time, however, conditions have been, in my opinion, practically reversed, showing that, due either to the association's work or due to the value of the code, the electrical manufacturing industry has changed from one practically bankrupt, which it was at that time, to a sound financial structure today.

"We who have worked under the code have found that in many cases it is proving eminently satisfactory, but I don't want to say that it is the panacea for all industry ills. Changes in codes will come as in NRA, and in my opinion we are going to be even better off in the future. The groundwork has been laid, the first preliminaries completed. On this experience it will be possible to lay out new laws which will benefit industry as well as the country.

"We have gone through what is called emergency legislation. We are next to face permanent legislation, in the drawing of which industry must help as a partner with the government to bring our nation back to the prosperity it has had in the past.

"The attitude of the recovery board is the finest I have ever seen. I feel sure industry will be in partnership with it and that it will look to industry more than has been the case in the past.

"The electrical manufacturing industry, in my opinion, is in a favorable position because of what has happened in the past year. The public utilities have lowered rates and put on promotion campaigns which have increased the sales of household appliances. Refrigerator sales were higher this year by a large percentage. Range business has increased. The utilities' promotion campaigns are going to continue, not as in the past, 'do it one year and stop the next.' The electrical industry is in a better position than any other to bring back a certain degree of prosperity."

Wide World

J. S. Tritle, retiring president of N.E.M.A., and W. J. Donald, managing director, whose efforts were largely responsible for the unusual success of the convention last week in Chicago

One of the members of the new Recovery Board, Arthur D. Whiteside, also talked to the group and gave an encouraging report and opinion. He is positive that NRA will become a permanent part of American economic life. He thought the new board would profit from past experiences in code formation and operation and urged industry to take constructive interest in code problems and possible legislation. He told Chicago business men that the President had stated that the board would be allowed to sit for 60 or 90 days without rocking the boat to see if business will respond. He thought that the new board and industry would work together in the public interest.

[*Continued on page 81*]

Oil Recloser for Distribution

Service Restored Promptly After Momentary Fault on Single-Phase Suburban and Rural Lines

By R. M. SPURCK
Assistant Engineer, Philadelphia
and D. K. BLAKE
Engineer Distribution Systems, Schenectady
General Electric Company

EXPERIENCE with automatic reclosure of feeders has naturally suggested a single-pole recloser having lower interrupting capacity than present oil circuit breakers for application to suburban and rural distribution circuits. A satisfactory equipment for this type of service must be simple, easily installed and comparatively inexpensive. The oil circuit recloser which is designed specifically to meet these requirements is a self-contained, compact equipment and requires no separate control source for its operation.

A new recloser has been devised for application to circuits from 2,200 to 7,500 volts where the short-circuit current is not more than 1,200 amp. Its continuous current rating is 50 amp. The complete single-pole equipment is mounted in a weatherproof case and arranged for pole mounting.

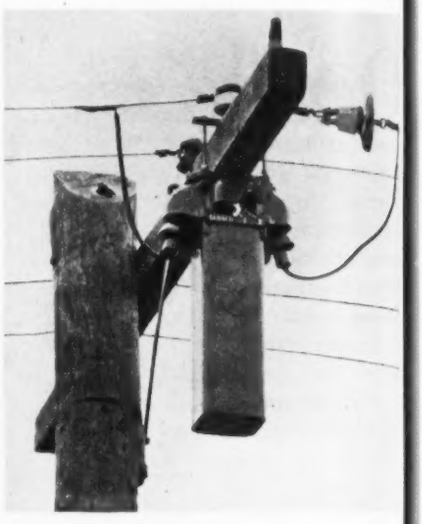
In normal operation the recloser is in the closed position and the load current passes directly through it. When a fault occurs on the line the recloser will automatically trip and quickly interrupt the fault current. After approximately three seconds the circuit is reclosed, and if the fault persists a second automatic opening takes place. If the fault still persists after a third reclosure the equipment will open the circuit and will lock itself open and remain so until the recloser is manually reset. If, however, the fault is removed by the reclosing operation the device will remain closed and automatically reset itself to the normal position ready for another complete series of reclosing operations.

The interrupting element is completely oil immersed. Contacts are of the butt type, the lower one being stationary and the upper movable. When the contacts part an arc is drawn and a gas bubble is formed. This gas bubble functions to force a blast of oil between the contacts, thereby preventing the arc from reestablishing after an early current zero.

Three elements in one tank

The tripping element of the oil circuit recloser is located just above the interrupting element and operates the movable contact on the impact principle. Energy is derived from the fault current which passes through the recloser trip coil and, after a very short interval of time, causes the armature to strike a hammer blow which starts the movable contact of the interrupting element.

Located in the top section of the equipment is the timing element, which serves three functions—timing, counting and resetting. After the interrupting element has opened the circuit the timing element inserts a definite time interval of approximately three seconds before allowing the contacts to reclose. The counting mechanism simply adds up the consecutive operations and locks the contacts in the open position after a predetermined number of operations—one, two or three—determined by an adjustment which may be made. The resetting mechanism goes into operation immediately after the contacts have closed. If they remain in the closed position for approximately ten seconds the equipment resets to its normal position and will be ready for another complete cycle of operations. The accompanying oscillogram shows the performance of the recloser taken with contacts in the closed position when the short circuit was thrown on.



Single-pole oil circuit recloser hung on crossarm for distribution continuity
7,500 volts, 50 amp.; interrupting rating 1,200 amp.

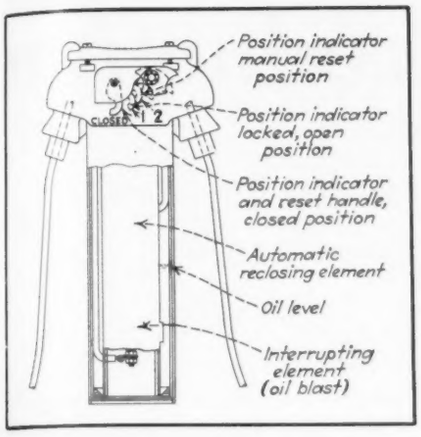
Stations, transmission and substations have been getting their share of improvements toward service reliability, and now it is surely distribution's turn. Multiple fuses and reclosures for polyphase feeders are at hand for the major lines and the same principles are being applied to the ultimate radials. Industrial service has definitely benefited by their availability. Good will of the mass of domestic users is equally worthy of cultivation in these days of refrigeration, cooking, incubators, clocks and what-not that brook no interruption.

Applicable to three principal situations

There are generally three distinct applications for the recloser:

1. Long branches connected to important feeders.
2. Branches passing through bad tree conditions.
3. Main feeders on the low side of step-down substations of low kva. rating.

Heretofore the only automatic reclosing circuit breaker equipments available for sectionalizing of lines


Position indicator manual reset position
CLOSED 1 2
Position indicator locked, open position
Position indicator and reset handle, closed position
Automatic reclosing element
Oil level
Interrupting element (oil blast)

External indication given to show switch positions

A resetting handle, serving also as a position indicator, is shown near the top. When the device is closed the indicator is in the position shown by the full lines, while the lock-out position is shown at position 1. To reset the equipment the handle is pushed to position 2 and released. After three seconds the indicator returns to the position shown by the full lines, the circuit will be closed and the equipment will completely reset itself.

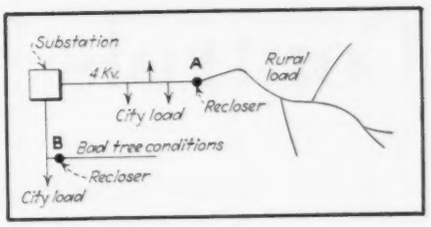
were of three-pole design having interrupting capacities considerably in excess of those required for many cases, with resulting cost that could not be justified in the scattered and lower capacity fields under consideration. The development of a single-pole, low-interrupting capacity device, such as the one described, contributes to the improvement of service at a cost that is fully justified in many instances not possible before.

Most rural extensions are single phase, operating between 2,300 and 6,600 volts. Some of these lines are many miles in length and therefore experience a proportional increase in the number of interruptions. They are frequently supplied from existing city circuits. Location of a recloser at *A* in the accompanying diagram (one in each ungrounded phase wire) protects the heavier city load from frequent interruptions when faults occur on the rural line. The automatic reclosing feature also improves service over that given by a fuse by quickly restoring service, because experience shows that from 75 to 90 per cent of the faults are momentary and self-clearing, but will blow a fuse and thus cause a long time outage. Repeater fuses are, of course, available, but do not give service equivalent to a self-resetting device such as the recloser.

Rural extensions themselves have occasional branches several miles in length which could profitably be connected to the main feeder through a recloser. This would improve service to the rest of the feeder by the selective feature of the recloser, which remains open after a predetermined number of reclosings. This will save considerable patrolling time and expense by confining patrolling and emergency calls to one specific branch or else save the many trips necessary to replace blown fuses where they are used to disconnect long branches.

Tree conflicts overcome

Primary lines sometimes encounter bad tree conditions which are a source of numerous interruptions, particularly during high winds, snow and sleet storms. Tree wire and tree trimming are usually the best solutions. but it occasionally happens that trees



City and rural service protected

Oil circuit recloser at *A* prevents interruption of city load in case of fault in rural line. Also, by reclosing quickly after nonpersisting fault, improves service on rural line.
Placed at *B* recloser relieves remainder of distribution system from interruptions which might result from faults in a circuit having bad tree conditions.

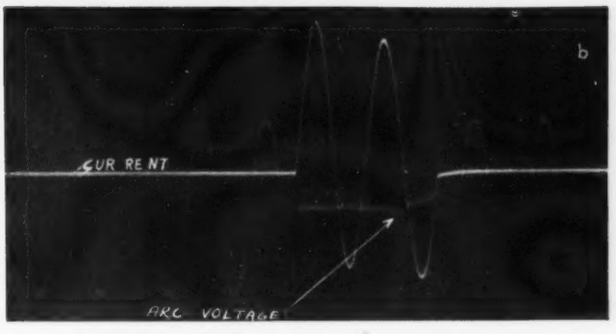
cannot be adequately trimmed and the length of tree wire required makes the cost unreasonable. Application of reclosers to such specific branches as shown at *B* in the first system diagram is worth considering, for they will confine the tree trouble to that specific locality.

There are many communities having from 100 to 2,000 consumers that are supplied by a single transformer substation connected to a high-voltage transmission line through a fuse. Sometimes an additional low-voltage fuse is applied to clear any faults that might develop on the local distribution system, but generally the high-voltage fuse is depended upon to clear these. Reclosers applied as shown in the second system diagram will provide service improvement at a moderate cost and give better protection to the transformer. The records of one company show that seven out of a total of fourteen installations experienced burned-out transformers that were not prevented by the high-voltage fuses (the only protection provided) when a short occurred on the low-voltage distribution circuit. Obviously the automatic features of the recloser will save a number of trips to these communities to replace blown fuses and prevent long duration outages for minor faults. Such communities in times of winter storms in some territories are difficult of access, so the trips saved and the improvement in service obtained by the automatic features are important.

The above discussion would not be complete without giving consideration to the co-ordination of the interrupting performance of the recloser with the blowing characteristics of the various fuses or the operating times of relays on the line. As an example,

[*Continued on page 80*]

a test in which the contacts are in the open position when voltage (7,200) is applied and the contacts closed against short-circuit current, immediately opening again and interrupting the current (800 amp.). In this case the operating time is even shorter than before.



Oscillograph tests show prompt response

(a) Contacts start opening approximately two cycles after the inception of the short-circuit current (628 amp.) and the 7,200-volt circuit has been interrupted before the next cycle has elapsed.
(b) Performance during

Controls That Aid Production

Protection and Continuity of Operation Essential in Industrial Production — How Electrical Control Does Its Work — Controls Available and Their Application

All industry is interested in electrification as the tool to aid in economy and manufacture. Electrical engineers and power sales engineers are the agents to apply electricity to industry. They need to be up to date. This article follows a series that gives information on motors and controls available for industry. Motor characteristics may be modified greatly by the use of modern control—almost anything may be done to fit a motor to production requirements. Essential elements of controls available for safety, for meeting duty requirements and for securing best operation are outlined in this fine article by Mr. Hall. It contains information that can be applied for industrial electrification.

By GEORGE H. HALL
Consulting Engineer, New York

IN INDUSTRIAL production it is essential that extensive use be made of electric controls in order to obtain the full value of electric operation. The employment of protective devices should be extended so that they not only protect the motor from injury, but also act to reduce loss of time and production that would be caused by undesired shutting down or by unintentional operation of the motor. Also, the co-ordinated operation of a number of motors may be involved in a complete system of electric drive, and this calls for the employment of accessory control features by which the functions of the control are widely extended and the value of automatic operation is more fully realized.

In general, these accessories may be classified under the following headings:

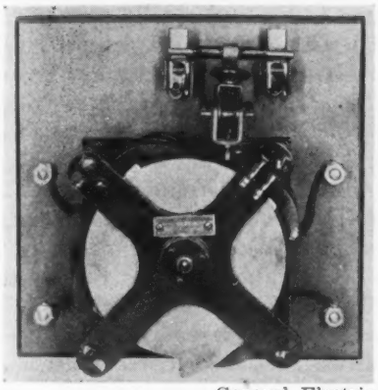
(*A*) Additional protective devices.
(*B*) Automatic actuating devices.
(*C*) Automatic stopping devices.
(*D*) Co-ordinating devices.

(A) Additional Protective Devices—In the operation of polyphase motors a failure may occur in one of the phases, most commonly due to the blowing of a fuse in one of the lines or by unintentional tripping of the protective relay in one phase only. Except in the case of two-phase, three-wire installations when the failure occurs on the common line, this interruption of current in one of the lines renders inoperative all but one of the phases on which the motor is running. When this occurs the tendency of the motor is to continue running on the uninterrupted circuit as a single-phase machine. As these conditions cause unnecessary blowing of fuses and delays in starting they should be guarded against by the use of a phase protective relay which, upon failure of current to flow in all of the phases, or of a reversal of phase, will cause immediate stopping of the motor.

A typical relay of this type consists essentially of two pairs of series coils, each pair connected in one of the power lines of the motor, a pivoted copper disk and a toggle mechanism which carries the control circuit contacts. When current is flowing in the coils under normal conditions the magnetic field produces a torque tending to rotate the disk. This torque is the resultant of a normal, three-phase torque which tends to turn the disk in a clockwise direction and a single-phase torque which tends to turn it in the opposite direction. Normally, the three-phase torque predominates, but the disk is kept from turning by striking against a stop. A reversal of phase reverses the direction of the resultant torque, causing the disk to rotate in a counter-clockwise direction until a projection thereon trips the toggle mechanism and thereby breaks the control circuit and stops the motor. In case of phase failure the three-phase torque is eliminated and the single-phase torque causes the disk to rotate in a counter-clockwise direction, causing the same result as in the case of phase reversal. This type of protective device is recommended for motors of 3 hp. and above.

Another cause of the shutting down of motors, with consequent loss of production, is due to interruptions occurring in the primary line circuits. Three-quarters of the interruptions are of a transient nature, so that the practice is fast increasing of equipping the main line circuit breakers with instantaneous reclosing devices. If upon the immediate reclosure of the breaker, after such interruption, the fault has not been removed the breaker again opens and this time reclosure is retarded, usually about fifteen seconds. Most breakers employing these devices will give a third reclosure in about 30 seconds, but if, upon the third reclosure, the breaker again opens it will then remain locked open until the fault has been investigated and removed.

But even with these momentary in-



General Electric

Protection against phase failures and phase reversal is had with phase-protective relay

terruptions the low-voltage devices on the magnetic switches and compensators by which the motors are controlled will drop out and stop the motors as standard low-voltage devices operate within a few cycles after interruption of the voltage. For this reason it is desirable that an appreciable delay shall occur before the protective device actually disconnects the motor from the line. Then, in the cases of instantaneous restoration of service, the motors will continue in operation.

With motors employing magnetic switches provided with low-voltage release coils this desideratum is secured by the use of a time-delay, under-voltage push button in lieu of the standard "start" and "stop" button. The time delay provided is adjustable to give a shorter period before tripping when less than 1½ seconds is desired. The motor may be immediately stopped at will by depressing the "stop" button.

When a compensator is used, in connection with a magnetic line switch which is equipped with time-delay device, it is necessary that it also shall be furnished with a delaying release so that it will not disconnect the motor from the line in case of momentary interruption of voltage. This is so constructed that it can be applied to the compensator in place of the usual retaining magnet.

(B) Automatic Actuating Devices—Automatic starters and controllers have their basic functions performed by electromagnets. In so far as causing them to operate, the intentional depression of a push button or closing of a switch is depended upon to cause them to function. While this is satisfactory in many cases, the full advantage of automatic control can be obtained only when the actuation as well as the operation is automatic. A wide range of such devices is available. A detailed description of them is unnecessary as they all act upon the principle of closing and opening the pilot circuit of the control. Some of the types are as follows:

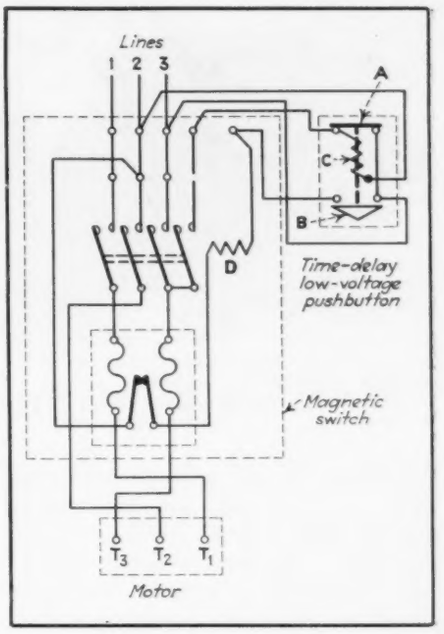
Float switches are used in connection with pumps for automatically maintaining the water, or other liquid, in tanks between a maximum and minimum level. They are actuated by a ball or cylinder which floats on the surface of the liquid. While float switches are actuated by the change of level in tanks, motors may also be automatically controlled by the variation of pressure or vacuum in closed systems by the use of pressure switches. These are employed to maintain a predetermined pressure between fixed maximum and minimum limits, either of liquid or air, by the control of pumps or compressors.

One type of pressure governor employs a curved Bourdon tube to the end of which is geared a pressure indicating needle which is mounted over a disk graduated in pounds pressure per square inch, inches of vacuum or water head in feet. A pivoted contact arm, also attached to the end of the tube, moves between two contacts which cause a relay to become energized or de-energized as the pressure reaches its minimum or maximum setting and thus causes the controller to function. The actuating contacts are adjustable so that the regulator may be set for operation at any desired pressure within the range of the instrument.

A somewhat simpler type of regulator is that in which a diaphragm is used in place of the Bourdon tube, and for many cases in which the regulation need not be as close it is entirely satisfactory.

Variable cycle operation

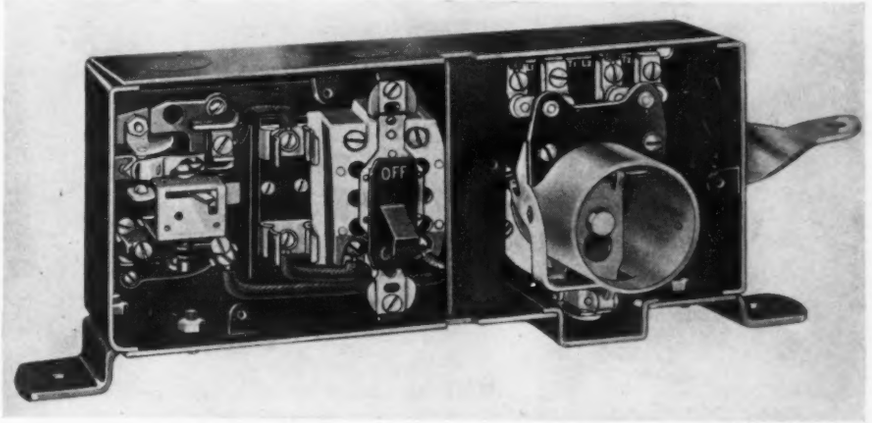
In many industrial processes time is a factor in that it is desirable to have the pump, blower or other part of the installation operate for a fixed lengh of time to be followed by a non-operating interval. As this cycle is continuously repeated the obvious type of control is some form of time switch. Such switches act upon the principle of opening and closing the pilot circuit at fixed time intervals. In



Service is improved by use of time-delay under-voltage push buttons with magnetic switch

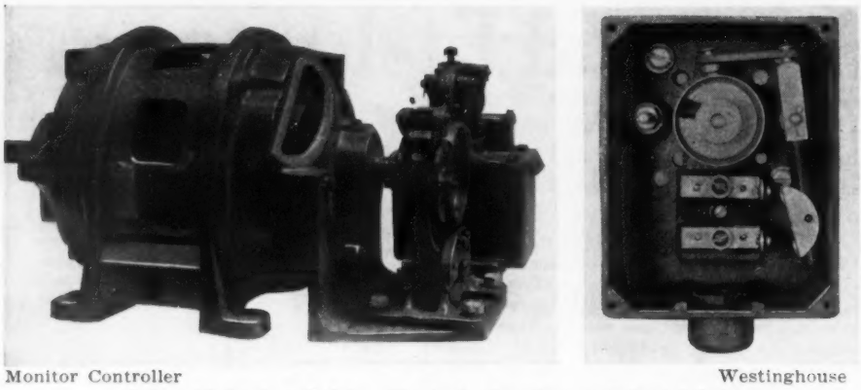
order to insure accurate timing they are generally equipped with self-starting, synchronous, Telechron motors, similar to those used in clocks, although for certain classes of service the hand-wound clock mechanism may give sufficiently satisfactory results. Time switches are made in a large selection of forms so that almost any schedule of "on" and "off" periods may readily be obtained. Many of these forms are adjustable, permitting the cycle to be varied at will, while others are factory adjusted for a single percentage of on and off time.

When it is desired to control the temperature of a room, refrigerating chamber or an oven, where a close regulation of temperature is needed, a thermostatic switch, or thermostat, is



Allen-Bradley

Rod-operated float switch with protection



Monitor Controller — Westinghouse

Solenoid brake (left). Typical plugging switch (right)

employed. In the case of refrigeration the thermostat puts the motor driving the cooling apparatus into operation whenever the maximum allowable temperature is reached and stops the motor as soon as the low limit is attained. A thermostat is rated for the temperature range through which it may be used and its regulation is the adjustment between on and off points within this range. Thus, a thermostat may have a range of 20 to 260 deg. F. and a regulation of 4 to 10 deg.

(C) Automatic Stopping Devices—There are many conditions under which automatic stopping assumes a rôle of equal importance. Motors must be stopped in case of overloads or loss of current. The use of auxiliary stopping devices to shut down the normally loaded motor at predetermined points is also essential in connection with many types of industrial machinery. For the accomplishment of this purpose limit switches are employed. Such switches prevent hoists and cranes from over-running their proper range; tables of reciprocating machines, such as planers, from over-travel, and valves from operating beyond the point where the gate is fully opened or closed. Limit switches are primarily used with reversing controllers as their usual function is to stop motor rotation in one direction preliminary to its being started in the opposite direction.

The track type of limit switch has an arm against which the machine table, or the elevator car, impinges when it reaches the limit of its travel and in so doing breaks the holding circuit of the controller, or, in the case of certain types of hoist limit switches, it breaks the main line circuit. In either case the rotation of the motor is at once stopped and made ready for starting in the opposite direction.

The same function is accomplished in the geared type of limit switch by the travel of a nut or a rotating cam which, upon completion of a predetermined number of turns of its driving shaft, breaks the pilot circuit. As soon as the motor is started in the opposite direction the limit switch again closes, or resets itself. A geared type of limit switch may be used to stop the operation of the motor at both limits of its travel, while with the track type a switch is used at each end of the travel of the machine bed or car whose movement it is used to control.

If, in addition to the circuit-breaking feature of the switch, an additional contact for circuit closing is employed, then the opening of the stop contact for movement in one direction will close a contact for the reverse direction and automatic machine movement forward and back, or up and down, may be obtained.

There are many applications in which the immediate stopping of the motor is imperative. To secure this result two methods are generally employed—the use of mechanical brakes and electrical means known as "plugging." The choice between these methods depends upon the individual conditions of the installation. Mechanical brakes are most generally used in connection with motors driving hoists, cranes, etc., where the brake must not only stop the motor but must also restrain it from being reversed by the load which the hoist is lifting. Plugging is usually employed in connection with reversing motors to bring them to a prompt stop preliminary to starting them in the reverse direction.

The mechanical, or solenoid, brake consists of a brake wheel, mounted on an extension of the motor shaft, which is restrained from turning by the application of two brake shoes held in contact with the wheel by the tension of a coiled spring. Such brakes are designated as spring-set as the brake shoes are normally in contact with the wheel. When current is applied to the motor a brake solenoid is energized which, through a system of levers, opens the brake shoes and, releasing their grip on the wheel, permits the armature to revolve. Cutting the current from the motor de-energizes the solenoid and the spring at once causes the brake shoes to grip the wheel and immediately not only stop the motor but hold it from reversal against any load that may be applied to it. A modification of the spring-set brake is that in which a thrustor is used in place of the solenoid for releasing the brake springs. The thrustor consists of a hydraulic cylinder containing a high-speed, motor-operated pump. When current is applied to the motor the

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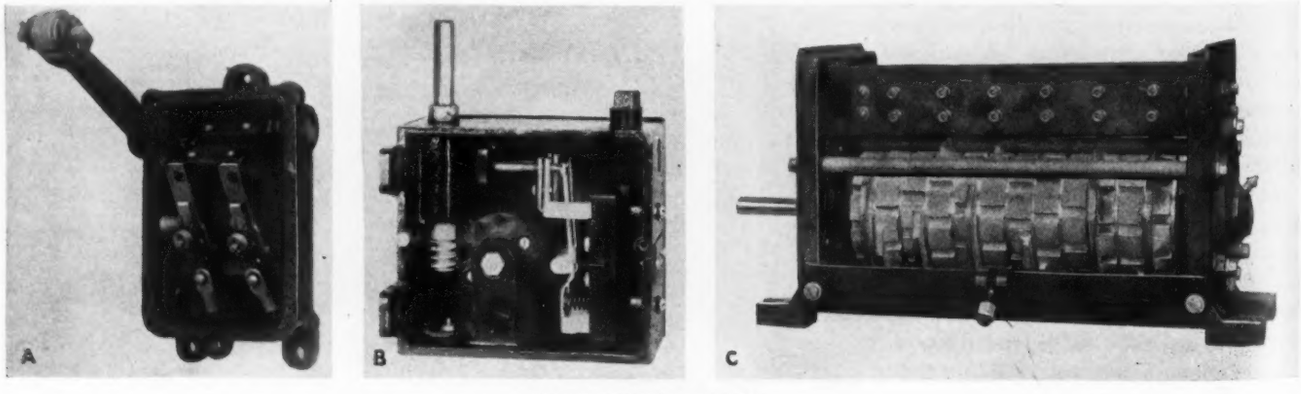


Typical limit switches

(a) Truck (Cutler Hammer). (b) Geared (General Electric). (c) Cam (Cutler Hammer)

Basis for Interchange Practice

Light Thrown on Interconnection Practices That Frequently Arouse Queries in Commission Hearings

What items are included in increment costs that determine charges for interchange power and how determined? What unit line-loss and maintenance expenses are deductible? When shall excess demands be carried on primary valve and when on secondary valve? Who shall protect or back up interchange power? How handle and charge for energy transferred across a system? New England decisions are discussed.

PRINCIPLES of economical operation underlying the interchange of power between the Boston Edison and New England Power companies were enunciated by R. E. Dillon, superintendent of the former's generating department, during the recent hearings before the Massachusetts commission. Extended treatment of the supply to the north Boston area on a joint basis and the production and transmission costs of the Edison company were presented in the August 4 and 18, 1934, issues. In Mr. Dillon's testimony considerable light was thrown upon interconnection practice, as indicated by the following comments:

During four afternoon hours it appeared that the Edison company sold New England Power a block of energy at 2.57 mills per kilowatt-hour. Questioned on the basis for this price, Mr. Dillon stated that it was the average of the Edison and New England increment costs for that occasion, viz., the median of 2.41 and 2.74 mills per kilowatt-hour. Edison's increment cost included coal, 1.96 mills; maintenance and supplies, 0.35 mill; line losses and station usage, 0.1 mill. The Edison increment rate was based on a fuel rate of 0.863 lb. of coal per kilowatt-hour when running on the turbine primary valve, the cost of the coal at that time being $5.094 per long ton, according to the company's exhibit. The coal rate of a turbine is obtained by weighing the condensed steam and checking the steam flow by flow metering at various loads, e.g., 5,000, 10,000, 20,000 and 30,000 kw. Weighing condensed steam is considered more accurate than flow meter readings. This is done semi-annually after the water rate of a turbine unit is well established by monthly or quarterly tests.

Each block of energy delivered from the Edison steam plants to New England Power is sold separately; i.e., if part of the load is supplied on a turbine primary valve and part on the secondary valve, the price is figured for each water rate. The slope of the steam curve increases rapidly beyond the point where the secondary valve opens.

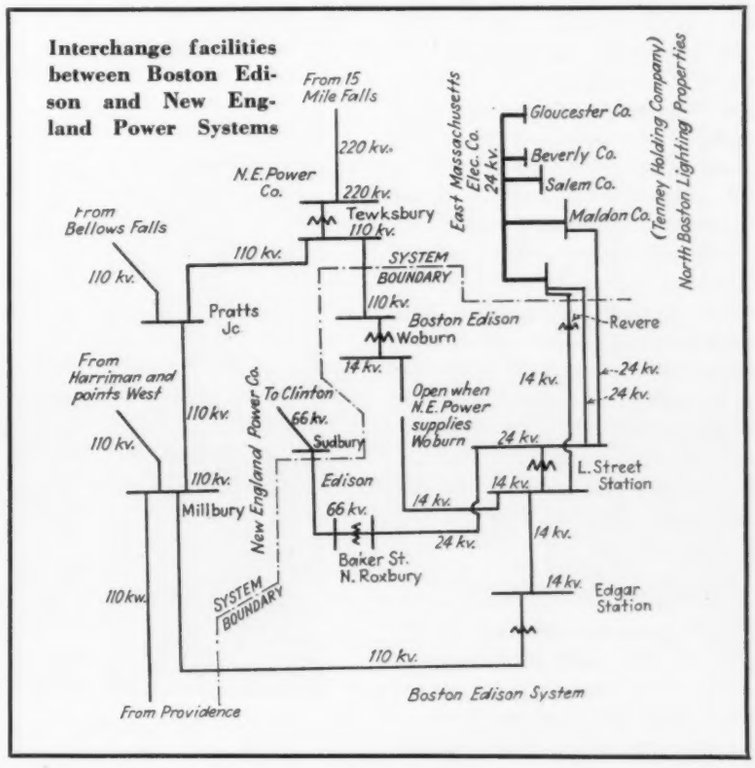
Maintenance costs are figured over a one or two-year period to get the average figures used in increment power analyses. These include building, boiler, turbine, electrical and miscellaneous boiler room repairs as classified by the state Department of Public Utilities, but in figuring increment costs the items which are not increased by the sale of interchange energy are deducted (such as building maintenance).

Interchange from most efficient sources

The primary valve takes care of about 75 per cent of the turbine rating. The question arose whether in some cases the output after the opening of the turbine secondary valve is supplied to the company's own customers, while the output corresponding to the unit's delivery with the primary valve open is delivered as interchange power. Mr. Dillon said that this cannot happen, because just before the company starts to sell interchange energy it is operating its turbines as economically as feasible on their own load. Thus, if five turbines are in operation, the load dispatcher has increment rate curves showing the variations in economy of the different units. These water or

[*Continued on page 64*]

Interchange facilities between Boston Edison and New England Power Systems



Building a Heating Load

Some Interesting Evidence of the Value of Advance Promotion in the Development of Electric Heating Business

By C. P. YODER
Industrial Heating Engineer
Buffalo, Niagara & Eastern Power Corporation

There is a surprising lack of familiarity with possible electric-heat applications and their advantages. As a result of educational activities, 1934 uses were increased 360 per cent over 1933 and revenue 272 per cent. How the market was analyzed for immediate prospects, how the prospects were interested, and how skeptical persons were convinced are some topics discussed.

WEEKS and sometimes months of promotional effort are usually required for the successful conclusion of electric heating sales. At least this is the experience of the Buffalo, Niagara & Eastern Power Corporation, western division of Niagara-Hudson System, operating along the Niagara frontier and throughout a large section of western New York State. This is borne out by an analysis of the heating load added during the first six months of 1934. It indicates that while an appreciable part of the 366 per cent increase over the corresponding period of 1933 may be due to improvement in business conditions, there is definite evidence that the promotional activities carried on during 1933 and previously were responsible for obtaining this load for electric heat.

Various fuels are serious competitors and the surprising lack of familiarity with the possible applications and advantages of electric heat among prospective users makes continuous educational and promotional activity of vital necessity. The value of such a program carried on modestly but continuously in our territory during the past lean years is now becoming apparent. These activities have been conducted without increase in personnel and mainly by emphasizing to all contact representatives the load-building possibilities in promoting electric heat.

Certain electric applications are now so firmly established that when new facilities are required by industrial and commercial users electricity is naturally turned to. The chief concern of the electric utility then becomes a question of size or quantity to recommend. Not so, however, with electric heat.

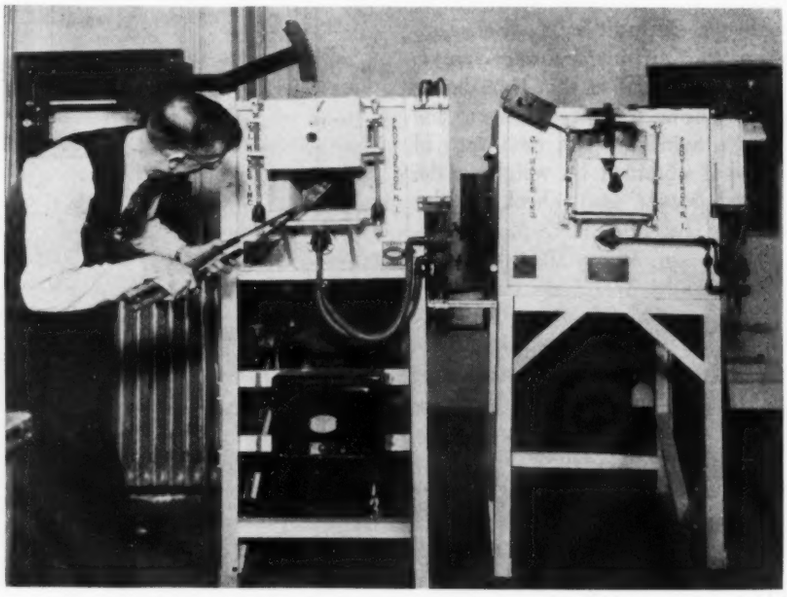
Analysis of load increase

Table I gives a summary of the first six months increased load as compared to the corresponding period of 1933. This includes all types of electric heating, which may roughly be divided into commercial, cooking and baking; small standardized heating unit applications and all other applications. The latter classification includes large industrial installations as well as those that do not properly fall within the first two classifications.

The estimated annual power consumption shows the same relative increase of approximately 360 per cent as the connected load, but the estimated annual revenue shows a smaller relative increase of 272 per cent. This is due largely to the incremental nature of the load, particularly the large industrial.

Both the estimated consumption and annual revenue are conservatively figured, on the basis of actual estimated individual use and rate applying to the specific application rather than by rule-of-thumb method based on connected load. The latter too frequently results in a more optimistic prediction than is obtained in actual practice.

In Table II the three major classifications are given to indicate the proportion of total load resulting from each. This breakdown is of interest in indicating the load-building value of each group and may be useful, in connection with a knowledge of the territory, in determining where to place the emphasis for future promo-



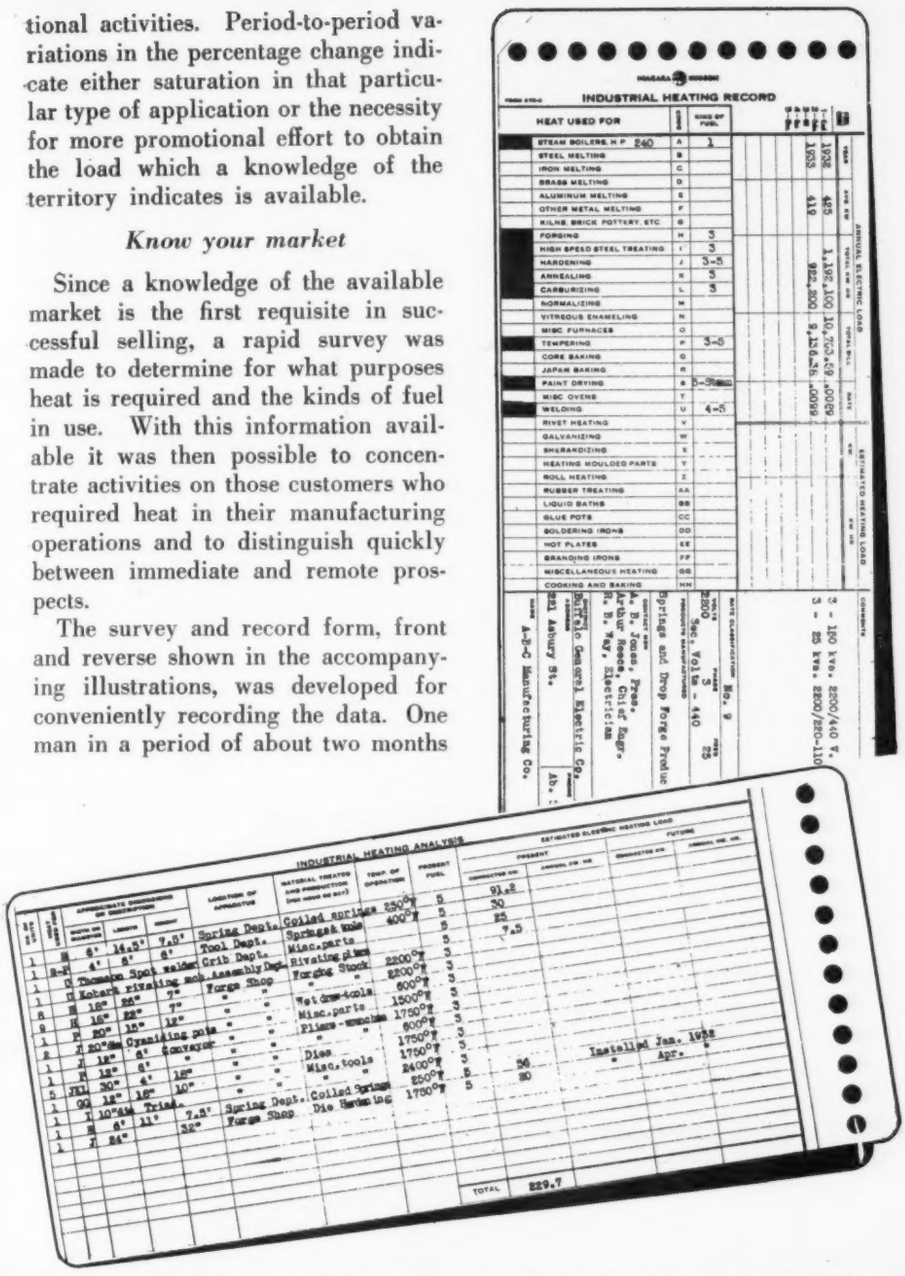
Curtain, preheat high-temperature electric furnaces used for demonstrating heat treatment of high-speed steel

tional activities. Period-to-period variations in the percentage change indicate either saturation in that particular type of application or the necessity for more promotional effort to obtain the load which a knowledge of the territory indicates is available.

Know your market

Since a knowledge of the available market is the first requisite in successful selling, a rapid survey was made to determine for what purposes heat is required and the kinds of fuel in use. With this information available it was then possible to concentrate activities on those customers who required heat in their manufacturing operations and to distinguish quickly between immediate and remote prospects.

The survey and record form, front and reverse shown in the accompanying illustrations, was developed for conveniently recording the data. One man in a period of about two months



Front of record form used for making survey (top). Reverse for analysis of applications (below)

surveyed more than 500 industrial customers and obtained the information shown on the front of the form. These forms are assembled for ready reference in visual index books. These data establish the foundation for further activities, whether they be personal calls, mailed literature, demonstrations or otherwise.

An indication of the convenience and economy of a survey recorded on these forms is indicated in the case of mailing of literature on hardening, for instance. A stenographer using the index book can at a glance pick out the customers doing this class of work, so that only they will receive this literature, which otherwise might be distributed to a number of plants having no interest in such information.

As prospects are developed, necessitating a more complete survey of their heating requirements, this information is recorded on the reverse side of the form. Such a record then forms a complete history of the present heating requirements and equipment of the particular plant, from which future promotional activities may be determined. Several years experience with this record system has demonstrated its usefulness.

Importance of demonstrations

One of the most effective mediums for creating interest and stimulating sales of electric heating equipment is by means of demonstrations. The demonstration kits prepared by the manufacturers of small heating units, as well as films of small and large applications, have been used in addressing groups of factory representatives ranging in number from six to 50. This has been found a most satisfactory means of presenting the subject and in addition to stimulating general interest in electric heating has resulted in a more favorable reception upon subsequent calls at these plants.

This suggested the idea of a demonstration program to appeal to the restaurant and lunch counter trade. Our commercial cooking specialist, provided with suitable demonstration equipment, visited each district of the territory, where meetings were arranged with the local restaurant and lunch counter operators. Practical demonstrations before these groups resulted in an encouraging number of sales and stimulation of unusual interest in electric cooking and baking.

The usual claims of merit advanced for certain recently improved processes or equipment over what has been considered standard practice frequently develops an attitude of doubt or suspicion on the part of the prospective purchaser unless the claims can be practically demonstrated.

In co-operation with the C. I. Hayes Company of Providence and the Buffalo Testing Laboratories, our company has also made two furnaces available to the heat treaters of high-speed steel in our territory. These furnaces are equipped with atmospheric control and other features to produce a higher quality product than has heretofore been possible. Facilities for carrying on practical heat treating within the limits of capacity of the furnaces are available and a great amount of interest has been created by the demonstrations that have been made. A substantial number of sales should result as soon as business conditions justify such expenditures.

In the case of electric melting of gray iron, the average foundry executive is either not willing or is in no position to make the necessary capital expenditure for an electric melting furnace unless it is demonstrated that the claims advanced can be returned in dollars and cents profits sufficient to justify such an expenditure. With approximately 45 operating foun-

Table I—Growth of Heating Load

Buffalo Niagara and Eastern Power Corp.

	First Six Months of 1934	First Six Months of 1933
Total load added, kw.	984.05	268.73
Estimated annual kw.-hr. consumption	848,346	235,924
Estimated annual revenue	$9,932.10	$3,653.88
Prospects developed during the period	175	32
Estimated prospective load developed, kw.	4,015	245
Total number of calls reported.	1,898	1,273
Number of men, full time	2	2
Number of men, part time	12	3

Table II—Classification of Load Added to Lines

	First Six Months of 1934	First Six Months of 1933
Cooking and Baking		
Total load added, kw.	257.45	112.46
Estimated annual kw.-hr. consumption	202,740	104,022
Estimated annual revenue	$3,541.52	$1,747.88
Small Standardized Heating Units		
Total load added, kw.	131.28	39.77
Estimated annual kw.-hr. consumption	101,862	28,666
Estimated annual revenue	$1,314.54	$294.50
Other Heating Applications		
Total load added, kw.	595.32	116.5
Estimated annual kw.-hr. consumption	543,744	103,236
Estimated annual revenue	$5,076.04	$1,611.50

dries in our territory our company has developed a program making available an experimental electric melting furnace to those foundries interested in this process. It is of the Detroit indirect rocking type with a cold melting capacity of 350 lb. and a connected load of 125 kw. A unit type of assembly is employed for ease in moving the installation from plant to plant. This equipment is loaned, set up ready for operation, for a period of approximately three months at no expense to the user other than for operating current and maintenance. The furnace manufacturer provides instruction and assistance in the operation of the furnace in order to demonstrate its advantages for the particular application.

In the accompanying illustration this furnace is shown installed in the first demonstration location. The period of test at this location has just been completed and has resulted in a request for an appropriation to purchase a furnace of 1,000 lb. capacity for permanent installation. It is interesting to note that all claims advanced for the superiority of this melting unit were thoroughly demonstrated as well as several not heretofore recognized.

This activity has stimulated an unusual amount of interest among the foundrymen in this territory and a number are on the waiting list to use the furnace as soon as it is available.

Flexibility of electric heat

An indication of the variety of applications for which electric heat is adaptable is indicated by the following list of installations taken at random from the business obtained during the first six months of 1934:

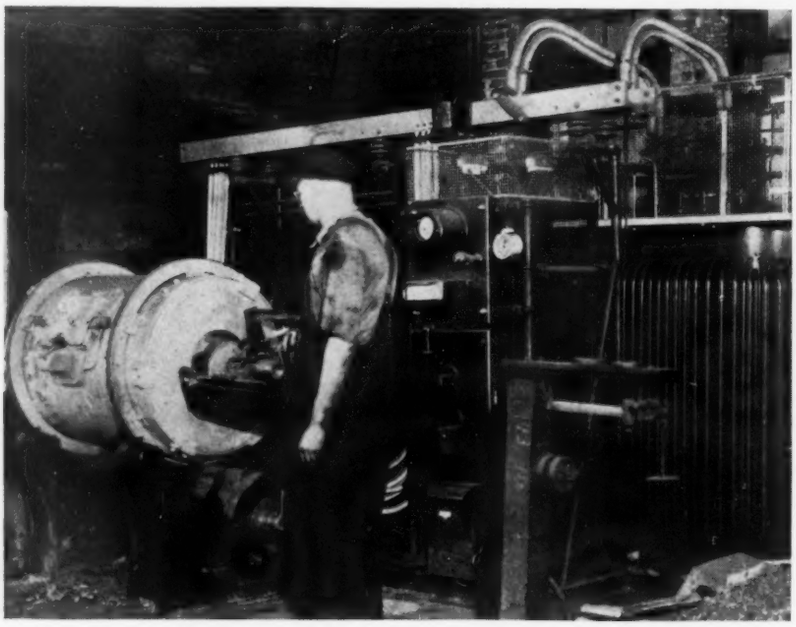
Bread toaster	Brass melting
Meat grill	Pastry bake-oven
Coffee urn	Steam table
Shoe vulcanizer	Soil heating cable
Electric range	Heaters in lily pond
Water heater	Seam welder
Air heater	Steam generator
Oil preheater	Vanilla percolator
Roll heating	Hospital sterilizers
Glue stock kettle	Leather polishing saddles
Instrument sterilizers	Silk ovens
Laboratory furnace	Heat treating
Fry kettle	Glycerin tank
Hot plate	Homo drawing
Peanut roaster	Popcorn machine
Arc-welding set	Shoe stitching
Pasteurizing unit	Japan baking

The raising of tropical water lilies is a precarious business during the mild temperatures of late spring and early summer. The water in this pond is automatically protected against low temperatures by thermostatically controlled immersion heaters of 2.4 kw. capacity. It's a far cry from this tropical lily pond to the gray iron melting furnace shown in the accompanying illustration, yet each has its specific use for electric heat and the small application should no more be overlooked than the large one. Each contributes its part in familiarizing the public, our customers, with the many advantages of electric heat.

Small standardized heating units

In 1933 the prevailing opinion indicated that the most encouraging possibilities were in the promotion of the small standardized heating units. Advantage was taken of the excellent campaign programs developed by several manufacturers and a concerted effort made to obtain our share of this business. In addition to a mailing campaign, a company representative visited all districts of the company, setting up a sales bogey and instructing company contact men in developing and reporting prospective business. In addition to definitely secured business this activity has resulted in an increasing number of active prospects, as indicated by the estimated prospective load developed during 1934 as compared to 1933 (Table I).

The contact men are not confining their efforts entirely to applications of small heating units, but are hunting down possible applications wherever they may be found. As a further aid, these contact men are supplied with a monthly bulletin giving information on new installations, recently developed equipment and other pertinent information on the subject of electric heat.



350-lb. electric melting furnace used in the promotion of electric gray iron

Nine Steps in Making Duct Splices

By T. C. HIERONYMUS*

Superintendent Underground System, Kansas City Power & Light Company, Kansas City, Mo.

*See "Duct Splices Rescue Cable from Junk," page 576, "Electrical World," April 21, 1934.

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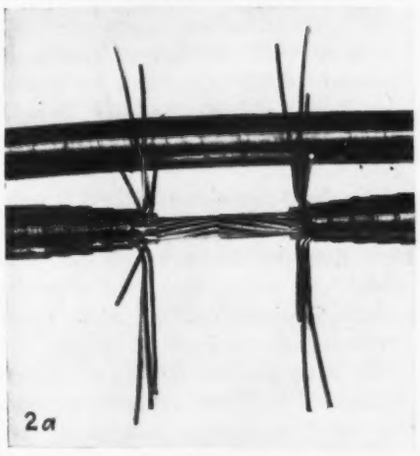
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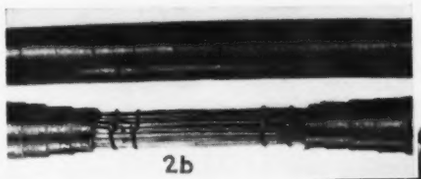
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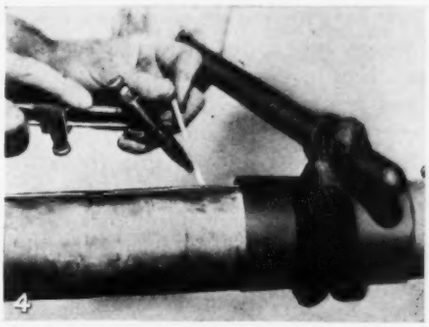
1 **The splicer splicing** — Final layer of paper is being applied to third conductor; joints in the two others are completed.

2 (a and b) **The conductor joint**—Alternate wires of the outer layer of strands of each conductor end are cut off and the remaining ones fanned out as shown. Then the conductor cores are cut off about half way back and the two ends butted together. The outer strands are now brought down, alternately one from each side, and tied with soft iron wire, which is removed after the joint has been sweated together.

3

3 **Ready for belting**—Conductors and jute filling are held together by bands of friction tape. Starting at one end the joint is now tightly wound with cotton tape overlapped about two-thirds. With the cotton tape held firmly the first layer of paper belting is started at the other end of the joint. Then the belting is wound on, following up the cotton tape as the latter is unwound. This procedure allows the paper to be laid on more tightly and more smoothly than would otherwise be possible.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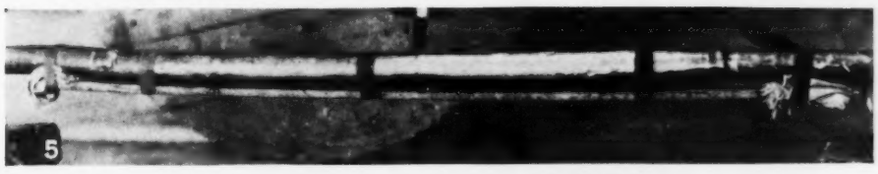
4 **Tacking the lead**—After paper belting has been applied, joint is sheathed with a sheet of lead, burned on. The lead is cinched tightly around the joint and held in place while being tacked down by the means here illustrated, quite primitive but very effective. A piece of 1/16-in. red fiber is wrapped around the cable and tightened up with a tourniquet.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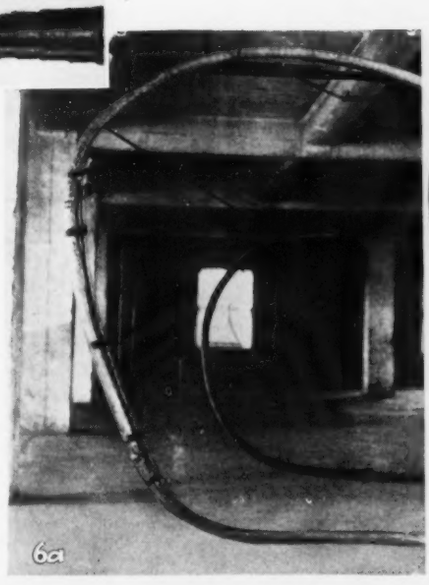
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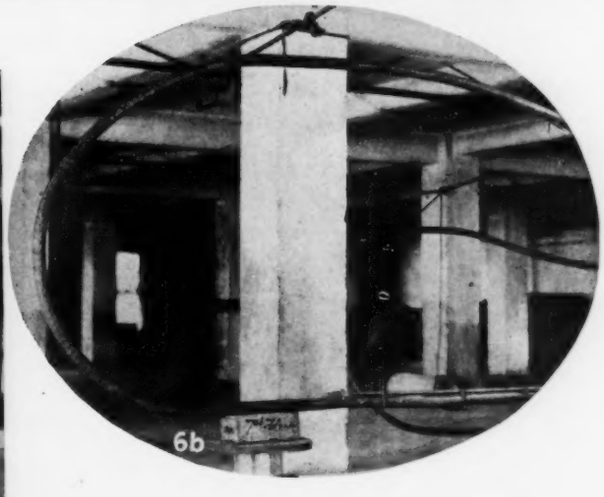
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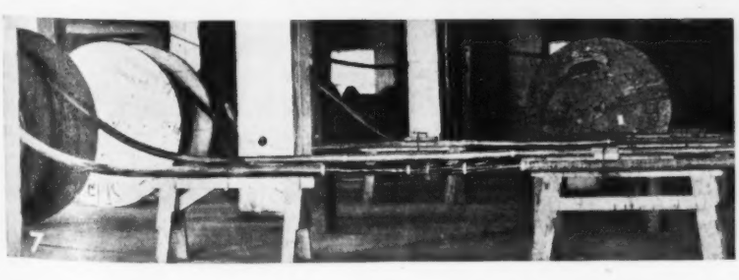
5 **Nearly finished**—The lengthwise seam of the sheath has been made and the top sides of the ends are burned. Since no one has yet devised a method for burning lead in an upward operation, the joint must now be turned over so the lower halves of the joint ends can be finished. In preparation for this a board stiffener has been lashed along the joint to keep it from bending during the turning operation.

6 (a and b) **Up and over**—The joint is turned over endwise, not rotated on its longitudinal axis as some readers of the earlier article* supposed. Sufficient cable is pulled out to allow the necessary looping. In view (b) the joint is in position for the lead-burning job to be finished.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7 **For production**—Two splicers and a helper are employed. By having several joints in different stages simultaneously each man is kept at work. One splicer applies insulation to one joint while the other man burns lead on a second, and the helper helps where he is needed.

Equipment for Better Seeing

More Profits, Greater Comfort, Enhanced Beauty Now Possible With Lighting Developments of Recent Years

EQUIPMENT is available for doing a better job of illumination in homes, stores and factories, but most prospects do not recognize the extent of developments, how to choose and apply them. Presentation of them in their various forms, makes and features is a combined personal-contact, publicity and advertising job. But generic types suitable for extensive application are discussed here.

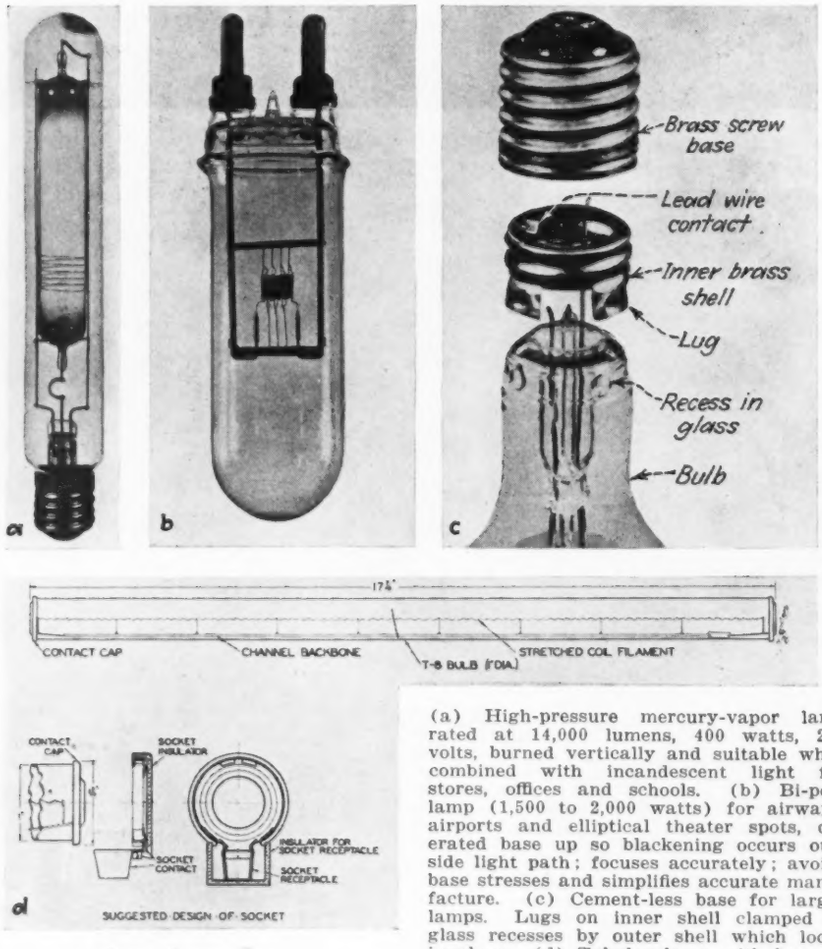
Some important developments for the home, store, hotel, office building and factory are illustrated and discussed. Architectural and special-effect lighting is a specialized problem and will be discussed only briefly.

Light Sources Take New Forms—Among developments in light sources which permit new or extended applications of light are: The high-pressure mercury-vapor, bi-post and cement-less bases, and tubular line-of-light lamps illustrated. Two-filament three-intensity lamps, available in three ratings — 100 + 200 = 300 watts, 150 + 200 = 350 watts and 200 + 300 = 500 watts—answer needs in all fields where high intensities are wanted for special effects or meticulous tasks, but lower intensities at other times. These lamps require special sockets. For intermittent photographic work, including movie studios, there is a new 2,000-watt floodlamp with 68,000 lumens of actinic light that burns fifteen hours total. Lamps that give enormous outputs intermittently (250 to 1,000 watts) and last two to ten hours total supplement this service. Submersible lamps of 1,000 watts can be used at any depth a diver can go. Tubular lamps up to 34 in. long and 1½ in. diameter can be squeezed into places where light is needed.

A new aluminum alloy having a reflection coefficient of 85 per cent, which can be applied as a veneer to existing aluminum, promises many revolutionary changes in lighting.

In and Around Home—A greater variety of lighting equipment affording comfort, beauty and utility and meeting every whim is available for the home. Some types were illustrated in the Sept. 29 issue. There are flashed-opal luminous panels that can be built into ceilings, over bookcases, around mirrors, windows and dressing tables, over buffets and kitchen worktables and in the heads of beds. In these can be provided colored, as well as white, lamps on separate control to produce decorative effects or facilitate ballroom or street make-up in the ladies' boudoirs.

Attractive pin-up wall units, in various designs, permit placing bracket-type lamps wherever desired. There are wall sconces accommodated up to 250-watt units and three-intensity lamps, units that can be set down as well as pinned up, I.E.S.-specification pin-ups, etc. Proper ratios of local and general illumination (not over 10:1) necessary to comfortable reading are provided by the newer direct-indirect portables. Any one who is not satisfied with the simplest design of the I.E.S.-specification unit can secure it with de luxe shades and pedestals. Its feature is the low intrinsic brilliancy of the direct-light source, the light-colored shade lining that gives good local illumination without objectionable spots showing through



Some lamp developments

(a) High-pressure mercury-vapor lamp rated at 14,000 lumens, 400 watts, 220 volts, burned vertically and suitable when combined with incandescent light for stores, offices and schools. (b) Bi-post lamp (1,500 to 2,000 watts) for airways, airports and elliptical theater spots, operated base up so blackening occurs outside light path; focuses accurately; avoids base stresses and simplifies accurate manufacture. (c) Cement-less base for larger lamps. Lugs on inner shell clamped in glass recesses by outer shell which locks in place. (d) Tubular lamp with base at both ends, laid end to end for continuous line of light.

the shade, the open top affording wide-angle indirect illumination and the spread of the shade affording local light where needed. In other semi-indirect types a small portion of the indirect light is deflected for local light and three-intensity lamps permit three levels of indirect illumination. Tubular lamps concealed in recessed reflectors under bookcase shelves afford convenient illumination.

Keyhole lights recessed in the door casing, ship lights and recessed port-hole lights for foyers, statuary and ornamental lights and miniature moonlight lamps that plug into wall receptacles for night light are some novelties. Tubular lamps in various-shape flashed-opal-glass cylinders and pylons add a decorative touch to such utilitarian applications as illumination at bathroom mirrors.

To discourage night-time burglaries there are floodlamps that can be attached to eaves of houses, back porch or garage to flood the side and back yards.

Shrubbery, flower beds and rock gardens can be made to look more attractive by night than by day with small floodlamps mounted on spikes, small lamps concealed by decorative shields, lily-pad under-water lamps, rocklights, etc.

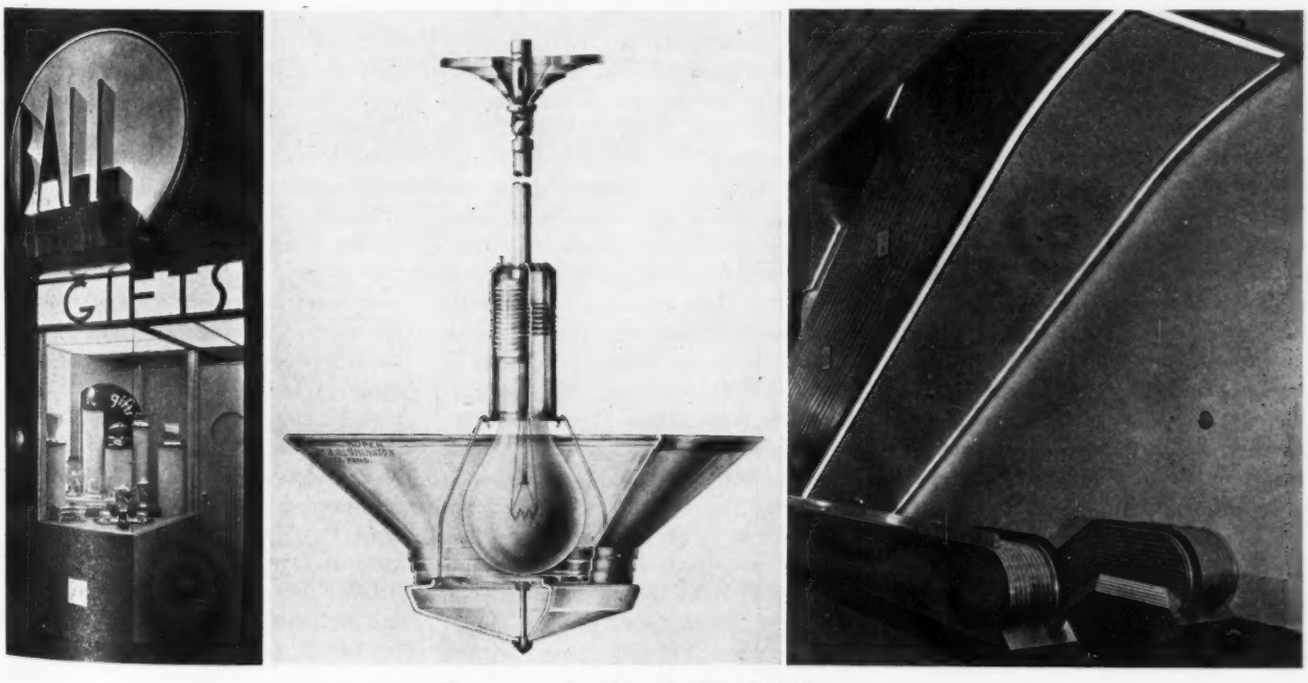
Store Fronts That Attract Purchasers—Proper use of light can attract attention of potential purchasers, display goods so they will sell quicker and draw customers to sections of stores otherwise less visited.

Despite all the excellent activities now being undertaken to train utility, jobber, dealer, contractor and department-store salesmen how to use new demonstrational equipment so customers will sell themselves on improved lighting, one very essential element must not be overlooked. That is to organize and co-ordinate resale outlets and contractor-engineers so that interested customers will find it easy to select and install the lighting equipment necessary for better seeing. If neglected, the awakened interest in improving lighting will wane and little will come of the efforts.

Store-front signs show a distinct trend toward the silhouette type. Some have a stain-less steel or aluminum-alloy background illuminated by lamps concealed by troughs forming the silhouette letters. Multiple silhouette or relief effects in color are produced by superposing trough-concealed lamps that illuminate as many levels of background. Other silhouette signs are made with flashed-opal panels bearing opaque letters or designs silhouetted by lamps behind, or with chipped plate-glass plated on back except around opaque sign letters to allow silhouetting by light from the rear.

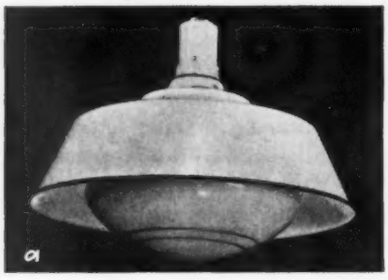
Show windows can have new drawing and selling power with all the developments in lighting. The newly developed three-second selling idea, made possible with proper light and a single display idea, opens up new opportunities. General and spot-lighting effects in white or color are afforded by luminous panels over show windows, lens panels, ceiling-mounted reflectors and spot lamps with color screens. Luminous panels can be lighted by as few as one lamp because the units can be spaced 1½ times their separation from the glass. Three levels of intensity can be provided with the same lamp equipment by using three-intensity lamps.

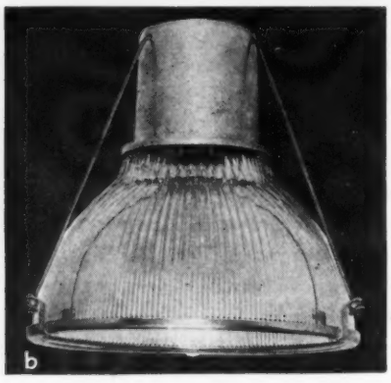
Inviting Building Fronts—Attractive luminous pylons or pilasters for each side of entrances are made of special glassware illuminated by tubular lamps of various colors. The entrances themselves can be made inviting by luminous ceiling panels, like those mentioned for show windows.

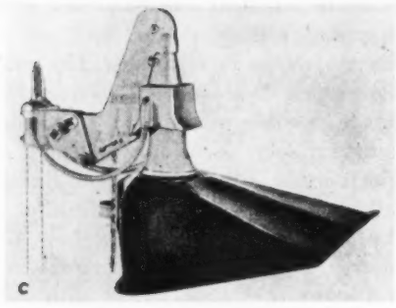


For stores, hotels and office buildings

Securing artistic yet adequate illumination with semi-indirect fixtures, combinations of general and localized spotlighting and equipment for artistic effects are trends in the commercial field. (a) Silhouette sign lighting, luminous panels over show window and entrance; eye catcher. (b) Semi-indirect unit having satin-finish disk in bottom with low intrinsic brilliancy, sealed against dust and bugs; swivel suspension; adapted to three-intensity lamps of 150 to 1,500 watts. (c) Just one application of line-of-light tubes over an escalator in the Marshall Field Building in Chicago.

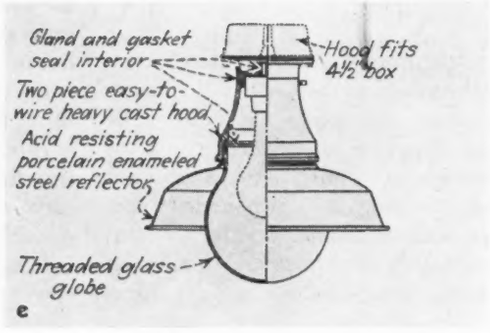






Some aids to industrial lighting

(a) Glassteel unit combining high-intensity mercury-vapor lamp with incandescent lamps. (b) Industrial replacement unit that fits RLM sockets. (c) Lamp-lowering arrangement aids cleaning and relamping. (d and e) Explosion-proof and heavy-duty vapor-proof units.


Gland and gasket seal interior
Hood fits 4½" box
Two piece easy-to-wire heavy cast hood
Acid resisting porcelain enameled steel reflector
Threaded glass globe

Mobile and steady color floods still permit attractive effects by night for building-front recesses, grillage and filigree panels.

Impressive Entrances and Interiors —Here the opportunities are numerous. One very attractive lighting effect for the main lobby of stores, public or office buildings, hotels and clubs is afforded by a ceiling panel of brushed steel, 20 to 30 ft. long, below which is suspended an ornamental metal trough with an opal-glass bottom. Small colored tubular lamps concealed in the trough with their axes set longitudinally produce curved color bands on the ceiling panel, like a beautiful rainbow, while line-of-light units concealed above the bottom opal panel give soft direct illumination.

The three-second selling idea has been made applicable to store interiors where attraction and selling must be done by individual displays in one second. Every niche inside a store, back of counters and elsewhere, can be made a single-idea show window by proper lighting.

Showcases on each side of aisles can have merchandise on opaque shelves made more attractive by tubular lamps concealed in trough reflectors under the shelves. Some products show up best with daylight units, others with plain incandescent lamps. Fitting mirrors for shoe, dress and clothing stores are made more effective by flashed-opal cylinders or luminous panels on each side or by soffit lighting. Here again tubular lamps have application. Displays of clothing are enhanced when illuminated by intense soffit lighting supplemented by flush floor lenses.

Three-intensity lamps find particular application inside stores, where a low level may be wanted at times and the highest level for best display or attracting customers. Combinations of general lighting and localized concentrated light are finding favor. One method involves cove lighting for general illumination and mirrored glass reflectors set flush with the ceiling to provide 30 foot-candles on the counters. Other methods include the use of a combination general-and-spot lighting fixture arranged over aisles and flush ceiling lenses over counters to avoid glare in customers' eyes.

Various makes and types of equipment for producing attractive yet utilitarian illumination are used in which the major portion of the illumination is produced by indirect light and the cold effect avoided by various ingenious ways of deflecting a portion of light for soft, glareless direct illumination. More attention is being given to eye comfort, relamping, cleaning, etc. Among alternatives are indirect lighting produced by lamps set in ceiling-beam channels, backed by reflectors and concealed by shields, and semi-indirect illumination from lamps set above several tiers of ornamental metal or plaster louvers.

Office lighting is provided by various adaptations of semi-indirect fixtures, and where detailed work is necessary, as in drafting, spotlights, concentrating ceiling lenses, combination general and localized-light units, etc., afford a solution. Private offices can use, in addition to this equipment, luminous ceiling panels and totally indirect and semi-indirect portables similar to those used in the home. Here again three-intensity lamps meet varying requirements of lighting.

Industrial Lighting That Best Utilizes Men and Machines — General lighting is still far below adequate levels in most industries. Light, properly used, is one of the essential tools for profitable production. But probably the greatest need which they will sense immediately is that greatly higher intensities are needed on certain processes and for detailed, meticulous tasks where spoilage, uniformity of product, etc., are greatly influenced by the seeing ability of workers.

For such purposes a multitude of units have been developed to spotlight the work. The chief precaution that should be observed is that with local spots of high-intensity light contrasts may be too great for good seeing unless precautions are taken. The ratio of local to general illumination should not exceed 10:1 and should preferably be 5:1. This requires raising general levels in many cases and the R.L.M. reflector and glassteel diffuser are still very important elements in industrial lighting. Then, too, spot lamps must be placed and directed so they will not glare in eyes of worker or cause specular reflections on work.

Guides for producing different in-

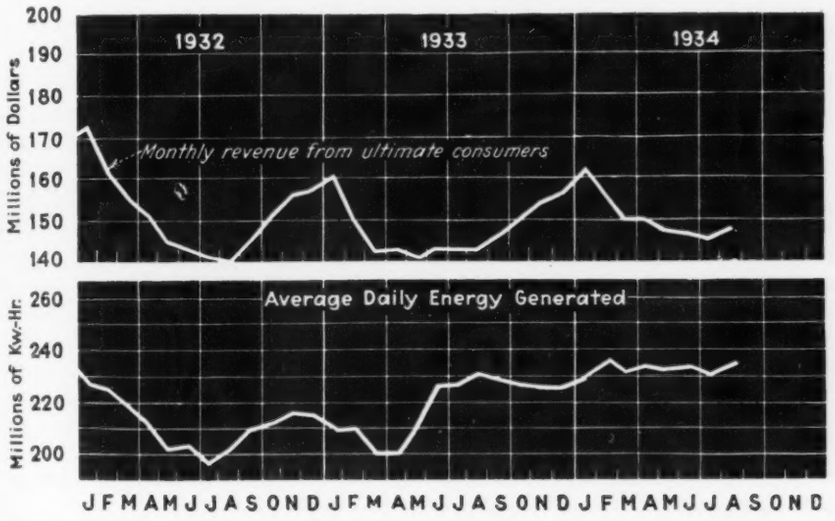
[*Continued on page 74*]

Utility Incomes Step Up

Gains over 1933 in domestic and retail commercial sales in August more than balanced a slight decrease in wholesale energy, increasing total revenue 3.5 per cent.

WITH a rise of 1.5 per cent over the preceding month, August revenue of electric light and power companies initiated the usual seasonal increase, but with somewhat more than the usual vigor. The total received from ultimate consumers amounted to $148,465,000, according to the Edison Electric Institute, and was 3.5 per cent greater than in the like month of 1933. This was an improvement over July, which showed a year's increase of 2.3 per cent. Moreover, it marked the eighth consecutive month of relative gains, bringing aggregate revenue thus far in 1934 to $1,206,780,000, against $1,166,230,000 in the corresponding period last year, a difference of 3.5 per cent. The favorable showing is marred by the fact that operating and maintenance expenses and taxes are known to have mounted materially, but comprehensive statistics are lacking.

Energy output for the month was 7,237,000,000 kw.-hr., according to returns made to the U. S. Geological Survey, compared with the revised figure of 7,172,000,000 kw.-hr. for July, and constituted an increase of 0.8 per cent over the final figures for August, 1933. A further decrease in output from water power carried this item 13.3 per cent under last year's August and called for a 9.5 per cent increase in production from fuel.



More revenue in Central States

Every geographical region reported more revenue than in July, but the changes were greatest in the Southeast and West. Compared with a year ago the higher percentages came in the Central and Pacific States, with a maximum of 9.1 per cent in the Southwest. Among the predominantly industrial areas, the East North Central led with a gain of 4.5 per cent.

Energy sold to domestic customers advanced 10.8 per cent over a year ago, exceeding the value for that item in August of any previous year, and retail commercial 6.5 per cent, but wholesale energy sales were off 1.9 per cent. The number of customers creased by about 620,000.

Average annual consumption per domestic customer has risen to 621 kw.-hr. from 601 kw.-hr. a year ago, balanced by a drop in the average rate to 5.35 cents and leaving the monthly bill unchanged at $2.77.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1934	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
August	148,465	+3.5	7,273	+ 0.8	2,340	—13.3	4,933	+ 9.5
July	146,529	+2.3	7,172	+ 2.3	2,428	— 7.4	4,744	+ 7.6
June	147,337	+2.8	7,039	+ 3.7	2,512	—11.2	4,527	+14.2
May	147,915	+4.8	7,193	+ 9.3	2,990	— 7.2	4,203	+25.2

Table II—Regional Revenue and Energy Output in August, 1934

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	148,465	+3.5	7,273	+ 0.8	2,340	—13.3	4,933	+ 9.5
New England	12,396	—0.3	491	— 6.0	139	—20.7	352	+ 1.3
Middle Atlantic	41,862	+1.8	1,757	— 1.0	395	—13.7	1,362	+ 3.5
East No. Central	33,566	+4.5	1,690	+ 2.7	91	— 0.7	1,599	+ 2.8
West No. Central	13,001	+6.7	488	+ 7.4	52	—43.2	436	+ 20.0
South Atlantic	18,523	+2.1	791	— 6.2	409	—11.2	382	— 0.5
East So. Central			321	+10.0	265	+ 9.3	56	+ 12.7
West So. Central	8,913	+9.1	425	+13.3	6	+10.0	419	+ 13.2
Mountain	4,406	+2.5	221	—11.7	164	—21.7	57	+ 38.8
Pacific	15,798	+5.5	1,089	+ 7.3	819	—12.3	270	+273.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.

Table III—Allocation of Energy, August, 1934

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,309	+ 1.3
Lost in transmission, etc.	1,327	— 1.4
Sold to ultimate consumers	5,982	+ 1.9
Domestic	957	+10.8
Com'l, small light and power	1,080	+ 6.5
m'l, large light and power	3,337	— 1.9
Municipal street lighting	166	+ 0.2
Railways—street, interurban	334	+ 8.0
Railroads—electrified steam	54	— 2.5
Municipal and miscellaneous	54	—14.2

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

One of a Series of Intimate Talks with Industry Executives

Cullinan Sees Changes

An Interview by
EARL WHITEHORNE

✦

FOR any electrical man who feels himself a martyr to the changing time here is a suggestion. Consider the wholesaler. He has survived more changes in the last quarter century than all the rest rolled together.

For years his job was to distribute line material for telephone and power companies and electrical supplies in ever-swelling volume to wire the homes and stores and factories of America. As wiring approached saturation, this business began to dwindle and lose its profit. Then came domestic appliances and the jobber turned from staple lines to this consumer merchandise to make his living. Next he took on radio, when appliance distribution started haywire. Then came hard times and hand-to-mouth buying. Men no longer carried big stocks and wholesaling had to be made over, from a business of selling to a large area from a jobbing center in bulk, into a local small-order service from jobbers to restricted territories, or from branch warehouses. Distribution in this industry has been a three-ring circus, with the wholesaler doing the ground and lofty tumbling.

Through it all one man has stood out like a beacon in the storm—sturdy, strong, calm, unhurried—a guiding light. Year after year, from a continued leadership in the wholesalers' national association, he has preached the gospel of sound economics. He has argued for the analysis of expense, the reduction of operating costs, the intensive service to smaller areas and fair dealing in business policy. He has thrown open his books to his competitors to encourage cleaner competition and widen his smaller competitors' knowledge of the business. He has been counsellor and friend to his own industry. He is George E. Cullinan, vice-president of the Graybar Electric Company.

We were discussing the other day the changes that are coming in distribution as business works back to volume again. "Hard times have taught one lesson that wise men will not forget," he said. "It has shown the value of concentrating on the thing that you do best. The smart man has asked himself, 'What do I create? What service do I contribute to the electrical business,' and decided to stick to that and let somebody else specialize on the other functions.

"We call this an age of specialization. This is particularly true of distribution. Warehousing has suddenly become more efficient. It had to. Since the beginning of this year, for example, our business has shown a healthy increase as compared with 1933. Meanwhile, however, our merchandise inventory has grown in percentage only one-fourth as much as our volume of sales. This was due to closer buying, better selling and more expert control. It is because of this specialization that the wholesaler can distribute products more cheaply than the manufacturer, the contractor or the power company. And this is easy to determine by any company that will analyze its own warehousing costs.

"I know of power companies that have made a study of what it actually costs them to move their supplies in and out of their own warehouse and found that they cannot do it as cheaply as the efficient local wholesalers can do it for them. They have accordingly turned over their warehousing function to the wholesaler, where it belongs. I have known of contractors who have gone broke because they purchased too heavily and let materials grow obsolete in their stockrooms. I know manufacturers who have thrown away success by loading excess distribution costs on a good product."

The last prosperity was concentrated in the large industrial and trading centers. Depression struck these regions hardest. The new prosperity is now coming back first to the small towns and rural areas. I asked Cullinan how this is going to affect distribution and trade in the electrical industry.

"It is bringing a new day to the small dealer," he said, "both the dealer in the small towns and the neighborhood dealer in the large city, and both the appliance dealer and the dealer who sells motors and industrial accessories. For the electrical industry realizes that it is selling power and not buying power that is needed to build up its volume of business once more. It appreciates the value of the close personal contact that the small town and neighborhood dealer has with his circle of customers. These men are more than retailers of appliances and sellers of industrial supplies. They counsel and guide householders and small manufacturers in their buying and exercise great influence in the selection of products.

"Understand, the large dealer will still have his place in the picture, as of old. But the small retailer who has survived the depression has real ability. But always it is his function that earns the profit and in the end the man who functions at the lowest cost makes the most money, which is as it should be. He makes the most money because of his specialized background and experience. It is when he tries to absorb some other function that he fools himself and fails, because he doesn't know that other specialty and doesn't think that way."

And if experience stands for anything, what George Cullinan believes about buying and warehousing electrical goods is worth considering. He is the Old-Man-of-the-Mountain in that business.

GEORGE E. CULLINAN, vice-president of Graybar Electric Company, a wholesaler of electrical supplies and appliances for thirty years, distributing through branch houses in 74 cities, and because of his broad experience and sound judgment, an authority in his industry on the economics and policies of distribution.

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L. W. W. MORROW · EDITOR

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The National Power Survey —An Opportunity

STATISTICIANS in utility centers have been struggling with the questionnaire of the National Power Survey of the Federal Power Commission. Shortly the statistical engineers of the commission will be struggling with the mass of data on many aspects of the power industry—power making, power interchanging and power using. The questions are many and exhaustive. That characteristic is in itself no cause for adverse comment. But it does create the risk of gathering such a mass of data as to make it difficult to digest, assimilate and interpret it.

Would it not be prudent to select only the dominant factors in the power situation and sort the data so as to contribute a solution to these problems? This would mean setting up for exploration a limited number of important economic controversies which, at least in some undertakings, have been answered in a manner which today overdoes the emphasis on what were apparently sound principles when commitments were made. Expediency here and there may have led to a fairly complete disregard of economic balance in the fields of generation and transmission.

The commission might, for example, undertake to study steam versus hydro generation. The relative first cost of each is totally different today from what it was five or ten years ago. What effects does such shift in costs have on the over-all cost of power? From the standpoint of national economy, what will be the effect of labor displacement (both direct and indirect) in developing the practically self-sustaining and automatic hydro plants at the expense of the fuel supply and labor-consuming steam plants? If the former does not result in a net total lower power cost as against the latter, might not subsidizing of hydro-electric development at the present time be counter to the call of national interests in a broad way?

Another study suggested is the economics of power transmission. Are there not definite and well-known economic limits to the distance of such transmission? This distance may be far shorter than popularly supposed. At what point can wire transmission no longer compete with rail transmission of energy in the form of coal?

Still another study of the American institution of power supply should be made. While engaged in an administration experiment to find a power-rate yardstick, might it not be in order to appraise the American achievement of the last two decades? How does our accomplishment compare, for example, with what has been done in England, France, Germany and Italy? Governmental or semi-governmental agencies have been functioning in the power field in some of these countries for years. How do their results compare with what has been attained here under purely private management?

There are obviously several other points to be cleared up. A factual determination of the answers to the most important of these would constitute a signal public service. The survey presents a golden opportunity for the commission and its staff to distinguish themselves in enduring manner.

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Taxpayers Hold the Bag

MOST forceful among the many arguments against the government program of water-power development is that there is no present market for the power. This argument is always summarily dismissed by the starry-eyed dreamers with the assertion that a market will spring up immediately to embrace cheap electricity when it becomes available. But events have a most distressing way of going counter to dreams. Already evidence is beginning to prove that markets for electric power, or for any other service or commodity, do not spring into existence spontaneously, but must be built by patient and intelligent effort.

An important factor in the decision to construct Boulder Dam was the impressive array of contracts for power, signed, sealed and delivered. That most of these contracts represented the same school of thought, of which the dam itself is a supreme expression, was of course of no moment in comparison with their seals and ribbons and weighty legal language. Now, however, when the project is getting along to the point where the blithe signers of these contracts can see ahead more clearly, they are beginning to think of reasons why the contracts should be modified, terms revised to avoid hardship, etc.

When Boulder Dam was being sold to the American people for $165,000,000, with great hurrah and hullabaloo, there was the city of Pasadena in the forefront of the contract signers, positively, confidently and joyously promising to take 68,000,000 kw.-hr. per year just as soon as Boulder Dam power was ready for delivery. But now, when the time approaches for the delivery of these 68,000,000 kw.-hr., Pasadena discovers that it cannot use so much power and asks the Secretary of the Interior to hold off the delivery of the full amount for three years until a market can be

created to absorb it. Pasadena is not the only southern California city to confess cold feet on Boulder Dam power. Glendale has asked for a five-year delay in which to take its contracted amount and Burbank wants seven years.

At a hasty estimate, it will cost the owners of Boulder Dam—the patient taxpayers who are paying for it—in the neighborhood of a million dollars to excuse the city of Pasadena from the terms of its contract. No figures on the Burbank and Glendale contracts are conveniently at hand to serve as bases for estimates of payments they are trying to evade. But it would be a conservative guess to say that the requests of these three cities, if granted, will deprive the patient taxpayers of about two and a half million dollars. And we have no assurance that other power contract signers will not ask for pieces of our national shirt nor that Pasadena, Burbank and Glendale will not return for another helping later.

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Does It Pay to Spend Now?

BECAUSE fixed charges on the investment in facilities for distributing energy already constitute a large portion of the cost of serving domestic customers some utility executives are very hesitant about spending more money for existing distribution facilities. Particularly is this true when engineers suggest ways of improving quality of service. Some executives have even told their engineers: "We are already rendering a higher grade of service than the income warrants and we can't spend money to improve it until the public appreciates that income must be sufficient to allow a fair return on the investment."

The factors stimulating this attitude are all real, and public appreciation thereof must be obtained in some way. But despite this situation, increased usage cannot be developed and some of the new business already obtained cannot be held if the quality and continuity of the power supply make the new usage unsatisfactory.

In the domestic field use of electric refrigerators, ranges, hot-water heaters, various heating devices, radios and electric clocks has demanded a higher grade of service than was ever required for lighting alone. A domestic customer can tolerate an interruption of electric lighting because emergency substitutes are available to tide over such periods. He can even get along with poor voltage regulation so far as lighting is concerned. But if poor voltage or service interruption causes food to spoil and ice cubes to melt, delays preparation of meals or prevents drawing hot water for baths or laundry, then electrical operations falls into disrepute.

Similar relations between energy usage and quality of service could be cited for commercial and industrial applications, but they should be self-evident.

The point is that failure of the public to appreciate cost of rendering service is not sufficient justification for delaying the spending of money, where needed, to render the quality of service that will stimulate and hold new uses of electricity in the home, office and factory. It is essentially a question of whether a utility expects to expand its income so a profit may be obtained, in spite of conditions, or whether it is content to let a cautious policy close the door to new revenue and possibly lose some business already acquired.

If the aggressive attitude is adopted, the utility will analyze the extent to which satisfactory usage of existing or new applications is handicapped by the power service. Then money will be spent for modernization so that new business and better public relations can be stimulated.

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Wholesalers Find a New Unity

CODE making has been good for the electrical wholesalers already. It has brought them together in a program for self-government and united them in action. They are finding out how useful this may be. The recent convention made this plain.

In an industry that is composed of three national wholesale houses and many local independents, there has been a natural cleavage. Despite the fact that the Big Three have long been leaders in the promotion of better trade practices and contributed greatly to the common knowledge of the economics of the business, there has been discord between them and the independents. Sometimes feeling has run strong. And it would not have been surprising if, in the building of the code, this very human conflict should have been intensified.

But the contrary has been the case. Code making has emphasized the common interest and the interdependence of large and small houses—national and local management. It has opened the eyes of all to the possibilities for bringing new economies to the processes of distribution. It has discovered the advantages that can be found in a closer co-ordination between the wholesaler and the manufacturer whose products he markets. It has put their feet in the path to progress.

There are no illusions in the group as to the uncertainties of political supervision. But this is their code. They have built it. It has set up rules that they can work under. The membership of the association is greatly increased. Code committees are organized throughout the country. Things are moving.

This was the spirit of the Detroit convention. A larger attendance, fuller meetings, harder working committees, a definite program, frank discussion and united action. It is an eloquent testimonial to the leadership of the past year. It holds fine promise for the future. For an industry that will govern itself soundly needs little help from Washington.

Commission Ruling on Knoxville Awaited

Final decision on T.V.A.-Knoxville deal expected next week—Engineer predicts $965,000 loss—Lilienthal testifies

Petition for the sale of Tennessee Public Service Company properties to the Tennessee Valley Authority has been taken under advisement by the state Railroad and Utilities Commission. The commission is expected to give a decision by October 31, when T.V.A.'s contract with the utility's bondholders becomes invalidated unless the deal is completed.

Testifying at the hearings held last week before the commission, J. H. Perkins, Birmingham consulting engineer, maintained that government operation of a utility plant in Knoxville would result in a hypothetical loss of $965,000 during the first year. "There is too little spread between the gate price (T.V.A.'s yardstick wholesale prices of less than 4 mills a kilowatt-hour) and ultimate cost to consumers," Mr. Perkins said. "There is no question that the electricity-consuming public would save money. What would happen to taxpayers is another question."

At an earlier hearing, David Lilienthal testified that the Tennessee Valley Authority will not hold itself subject to the jurisdictions of the public utility commissions of Tennessee and Alabama. "My recommendation to the (T.V.A.) board would be that we cannot, under the Constitution, voluntarily subject ourselves to state regulation," said Mr. Lilienthal.

This week the Alabama commission overruled a T.V.A. motion to dismiss intervening petitions on the sale to T.V.A. of Alabama Power Company properties.

Memphis utility's plea denied

The city commission has unanimously overruled the proposed delay in the referendum on issuing $9,000,000 in city bonds for a municipal distribution system for T.V.A. power. The Memphis Power & Light Company protested against the final passage of the ordinance. The company charged that the report of the engineer employed by the city greatly underestimated costs and said that construction and operation of the plant would result not only in no profit but in serious and recurring losses to the city amounting to hundreds of thousands of dollars annually. The company stated that if enough time had been allowed it could offer a solution much more desirable than that suggested by the engineer and containing no element of uncertainty or possibility of loss to the people of Memphis.

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Stocks Sold at Profit by Insull Syndicate

Testimony that a syndicate formed by Samuel Insull sold 417,000 shares of Middle West Utilities stock at more than $18,000,000, which was above the market price, to two of his investment trusts in 1930 was presented by the government at the hearing being held in Federal Judge James H. Wilkerson's court. The government also presented figures which, it alleged, showed that Mr. Insull and members of the syndicate made a profit of $2,299,067 on the sale of the stock to the investment companies. This profit was 26 per cent of the syndicate's actual investment, the government contended. Other evidence produced was to the effect that Mr. Insull and his associates sold 101,000 shares of common and preferred stock of Insull Utility Investments, Inc., to the Corporation Securities Company in August, 1930, accepting a demand note on the company for $6,595,000.

The stock market duel between Samuel Insull and Cyrus Eaton of Cleveland cost stockholders in the Insull companies $56,000,000, according to evidence offered by the government. It was agreed to pay Mr. Eaton $48,000,000 in cash and $8,000,000 in stock of Insull Utility Investments, Inc., and the Corporation Securities Company for the Insull stocks he held. Corporation Securities bore its half of the purchase through the sale of $40,000,000 of serial gold notes to the public by Halsey, Stuart & Company, four of whose officers are also defendants.

E.E.I. Meetings Held in Chicago

Several of the reorganized committees of the Edison Electric Institute met in Chicago this week. Prime movers, transmission and distribution and electrical apparatus held individual meetings that were well attended. This was the first meeting of the reorganized committees, which enlarged their scope and membership. Most of the work of organization has been completed so that full time was given to engineering and economics. How to save money in construction and operation was one general theme in all discussions. Another was the announcement of new products and of improvements in existing equipment. Grounding, lightning protection, line loadings and structures had equal play with many other topics in generation which brought out experiences and opinions.

The recent law for lighting structures on navigable streams to protect airplanes was explained and work is under way to get clearer agreements. Continued use of bare wire was recorded. Operating performance data on service and equipment was encouraging, but several suggestions for improvement were made. Lighting flickers and their causes called out many suggestions for elimination, including pro and con arguments as to changing transformer designs. Cable developments and performance called out a large group of men and indicated that steady progress was being made. These meetings indicated the need for active committee work and showed the advantage of the changed scope. A. L. Iddles is chairman of the prime mover committee, Mark Eldredge of the transmission and distribution committee and W. F. Sims of the electrical apparatus committee.

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Culpeper Plant Dedicated

First of the municipal electric plants to be furnished with a P.W.A. grant of money, the Culpeper, Va., installation was dedicated on October 18. This town of 2,300 population was already famous as having been laid out by George Washington. Its newer fame is based on the $160,000 of federal funds advanced to cover 30 per cent of the outlay for labor and materials on the project. Other than this index of an expenditure of about $500,000, neither the details nor the economic analysis in which the expenditure was assumed to be justified have been made available for publication.

Henry T. Hunt and Philip B. Fleming, chairman of the Electrical Board of Review and acting deputy administrator respectively of the Federal Emergency Administration of Public Works, lauded both the recovery accomplishment of that agency and the achievement of the town in acquiring a publicly owned utility.

N.E.M.A. Meeting Breaks Records

Code operations discussed in 110 group meetings — Policy statements encouraging for future code and business conditions — Annual report shows gains in all activities — Swope makes excellent address

About 1,000 representatives of 631 manufacturers attended the annual meeting of the National Electrical Manufacturers Association in Chicago last week. Two general meetings were held, 110 of the 175 subdivisions held group meetings and some twenty general committee meetings were held. At the election of officers, F. C. Jones, president of the Okonite Company, was elected president to succeed J. S. Tritle, vice-president of the Westinghouse Electric & Manufacturing Company. New members of the board of governors elected were G. F. Draffan, Ohio Brass Company; L. W. Grothaus, Allis-Chalmers; B. D. Kunkle, General Motors; T. O. Moloney, Moloney Electric Company; M. Porosky, Holtzer-Cabot, and C. E. Swartzbaugh, Swartzbaugh Manufacturing Company. R. Edwards, F. W. Magin, S. L. Nicholson and C. L. Pierce, Jr., were re-elected.

The N.E.M.A. code was the fourth signed by the President and is considered a model for large industries. Under the leadership of J. S. Tritle the manufacturers have organized and operated as a self-governing unit with great success and code operation is an accepted going concern. The supplementary code now in Washington is expected to be signed promptly. Both Mr. Tritle and A. D. Whiteside stated that the new recovery board of NRA would be fair and would encourage business. They also said some form of NRA was here to stay and suggested that industry do its utmost to aid in the preparation of suitable legislation.

Payrolls increased $250,000,000

The electrical manufacturers now operating with N.E.M.A. make 85 per cent of all electrical products and do a gross business of $600,000,000 at the depression level. Despite the great shrinkage in business volume, these manufacturers have reduced hours per week to 36 and have added nearly 150,000 employees, with a corresponding payroll increase of $250,000,000 a year. According to Mr. Tritle at least half of this increase has been due to operations under the code. At the present time business is improving, especially in consumer goods lines, but most manufacturers feel confident of better business in the future.

Acceptance of the code is now universal and operations are getting to be routine. The compliance committee handled 434 complaints during the year and have now 48 unadjusted, most of them of recent origin. Of the complaints handled, 32 were statistical, 66 concerned with labor and wages, 173 on filing prices, four selling without filing prices, nine on government bids, 23 selling below fixed prices, 45 on code status, 80 on code interpretation and two on selling below cost. This record is considered remarkable considering the scope and newness of code operations.

The cost of operations under the code is about 1 per cent of gross volume. Income last year was $559,000 and expenses $430,000 and a budget of about $600,000 is accepted for the coming year. A large item of reserve is held as an equity for members. The results of operations under the code of course vary widely with the product subdivisions and product classifications. In general, developments have been steady and consecutive toward a routinized operation. Some groups were formerly organized, others were not. Some false expectations are held. Some attempts at too much detail in supplementary codes were made. It was apparent, however, that the vast majority of those present accepted the code as useful and valuable and were confident of its final effects. This is a contrast to the last annual meeting and speaks well of N.E.M.A. leadership.

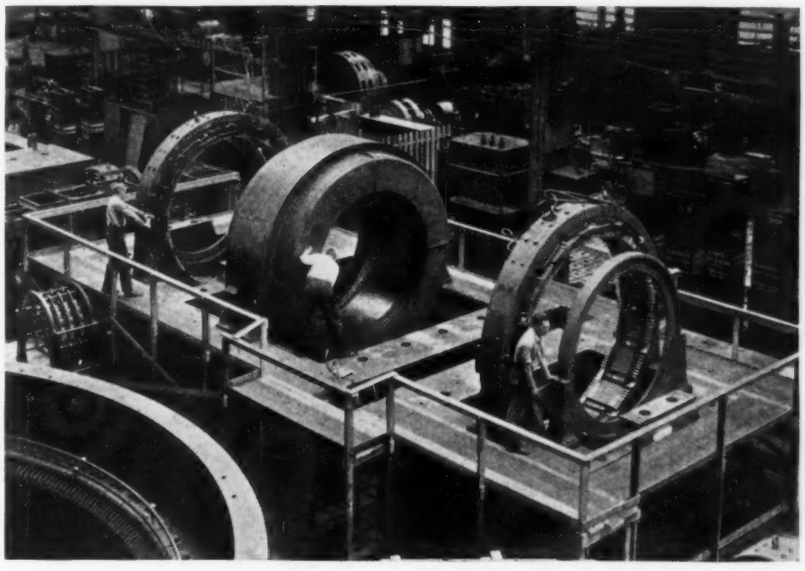
Development of statistics, cost accounts and other data forms required under the code continue. Many committees are at work in co-operation with other bodies. Code and standards work continues with unabated speed and several new suggestions for standardization were presented at the meeting.

So far as a public presentation of code operations and details were made in the annual report of N.E.M.A. a splendid case is made for the code. At the meetings in Chicago the sentiment was also expressed by the leaders and a most reassuring note was added about the fairness of the new recovery board and its intent to work as a partner with the industry.

Tritle hopeful for the future

A high light of the Chicago meeting was a splendid talk by Gerard Swope showing the fallacies of the proposed 30-hour week and the essential reasons why production to lower costs offered the only road to prosperity. This meeting largely was concerned with detail group activity and the 110 group meetings to still further advance code operations were well attended and very successful. It was apparent that the manufacturers have perfected their organization and laid a strong foundation for further advances, as pointed out by J. S. Tritle. He gave a splendid presidential address and a very encouraging picture of business in the future. His untiring work for the past two years was given a fitting tribute when he was given the McGraw award with genuine and unanimous acclaim.

FORD M.-G. SET GOES TO TEST



Prior to test runs, these student engineers in the testing department at the Schenectady Works of the General Electric Company are checking up the assembly of the large motor-generator set for the 7,000-hp. steel-mill motor soon to be installed by the Ford Motor Company. The set consists of two 3,000-kw., 750-volt generators, a 5,000-hp., 13,200-volt induction motor, and flywheel

New Unity Among Wholesalers

National Electrical Wholesalers Association meets to organize for constructive action under the code — Official definition of wholesaler adopted — Government viewpoint given — Code brings harmony

Electrical wholesalers turned out in unusual numbers for the first convention of the National Electrical Wholesalers Association since the approval of their code. About 200 wholesalers and 150 manufacturers registered for the meeting in Detroit, October 14 to 17. There was intense interest to see how the association would operate under the code, how the code committees would function and what would be done.

Most of the work, carried on in meetings of the executive and commodity committees, resolved itself into two general objectives—first, to get behind the code to make it effective and, second, to build up a closer co-operation with the manufacturers to strengthen the distributive machinery of the electrical industry. Two steps were taken to this end—first, the following definition of an electrical wholesaler was adopted:

The term "Electrical Wholesaler" as used herein is defined to mean a person, firm or corporation performing the functions hereinafter mentioned, not less than 75 per cent of whose total electrical business is the sale of electrical commodities at wholesale to dealers for resale; to electrical contractors; to steam and electric railroads; to federal and state governments and municipalities; to public utilities; to industrial companies which have electrical maintenance departments, and to manufacturers requiring electrical materials in the fabrication of their product.

Provided, however, such person, firm or corporation performs the majority of the following functions:

1. Maintains and warehouses an adequate stock of standard electrical commodities sufficient to supply the trade.
2. Maintains delivery service and facilities for pick-up service.
3. Maintains a selling organization trained to promote, specify and quote on electrical commodities, and properly to handle matters of service or misunderstanding with customers.
4. Distributes catalogs showing and describing the most essential items in common use in the industry.
5. Extends justified credit to the buyers within his territory upon reasonable terms, and does not perform such wholesale functions to secure wholesale prices for the benefit of associated or allied persons, firms or corporations.

Manufacturers will be encouraged through the commodity committees of the association to accept this definition to govern in the selection of their wholesale distributors. These committees are also developing, through co-operation with the manufacturers, a recasting of resale schedules based on the study made last year of the cost records of the three wholesale chains. Full recognition was given, however, to the fact that unless the wholesalers will give a united support to such revised schedules the strengthening of the distributing machinery of the industry could not be achieved.

In discussing the administration's view of the whoesalers' code, E. O. Mather, deputy administrator, said that the problems of distribution are receiving increasing attention in Washington. Manufacturing industries are finding that codes covering production alone can only partially solve their difficulties. Therefore NRA is fast becoming distribution conscious and the entire question of differentials between wholesalers and retailers, the place of wholesalers and distributors in the economic picture and the status of manufacturers distributing to the same class of customers as wholesalers is being actively studied. He stressed the fact that the true success in the administration of the code lies with the industry itself, however.

In the one open session on the program J. F. O'Brien, Westinghouse Lamp Company, presented the wholesalers' interest in the Better Light-Better Sight campaign. F. R. Eiseman, Revere Electric Company, discussed credit problems and Alfred Byers of N.E.W.A. the wholesalers' interest in the Federal Housing program. The McGraw Award Wholesalers Medal was presented to Walter J. Drury (see page 47).

F. R. Eiseman, secretary-treasurer of the Revere Electric Company, Chicago, was elected chairman of the executive committee and therefore becomes head of the association for the coming year. Mr. Eiseman now serves on the code authority.

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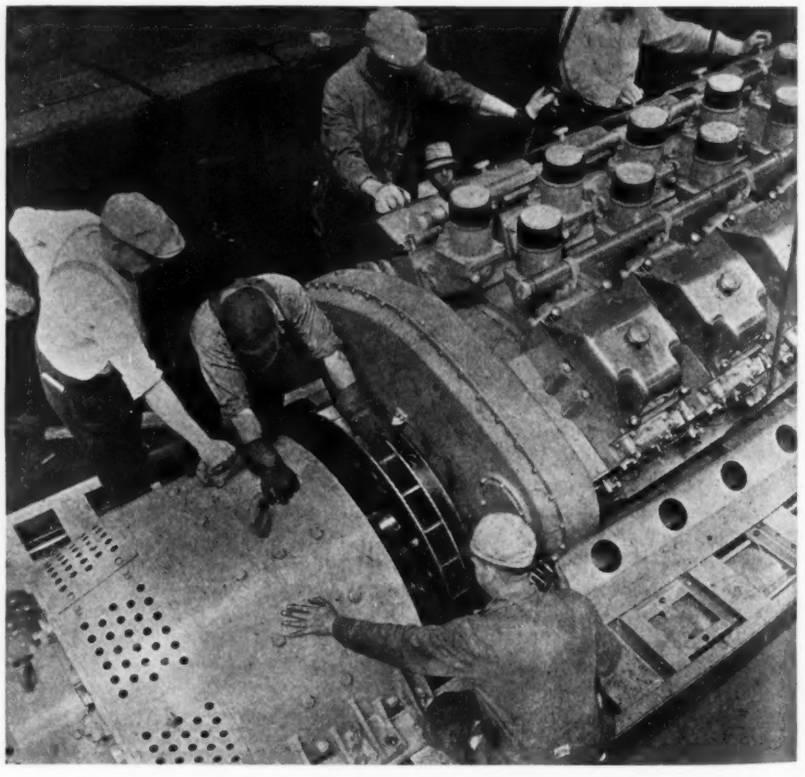
F. J. Sprague Dies Suddenly

Just as this issue of ELECTRICAL WORLD is going to press, the lamentable news is received that Frank J. Sprague, pioneer in horizontal and vertical transportation, died today (Thursday, October 25) at 3 a.m. His contributions to railway and elevator transportation are widely known. His death is not only a national loss, but an international one, and he will be missed by a multitude of personal friends and the entire engineering profession.

STREAMLINED TRAIN BREAKS RECORD



Union Pacific's new six-car streamlined passenger train completed the trip from Los Angeles to New York this week in 57 hours. The accompanying picture shows workmen installing the 12-cylinder, 900-hp. Winton Diesel engine and the direct-connected General Electric generator which converts the output of the engine into power for the four G. E. traction motors on the first and second trucks of the train

I.E.S. Meets in "House of Magic"

New York section, viewing first display of auditorium lighting innovations, hears convention reports

Demonstration of striking new effects in auditorium lighting, of novel and optical phenomena obtained with the use of gaseous conductor lamps and of other recent developments in light production and control featured the meeting of the New York Section of the Illuminating Engineering Society in the G. E. "House of Magic" conference room in the evening of October 16. These color effects, including a blue that cannot be washed out by the flux from the incandescent cove lamps, are obtained with a consumption of less than 3.5 watts per square foot of floor area.

A. L. Powell, the new president of the society, described the installation, which includes numerous features of interest and beauty, the outstanding one being the manner of painting the ceiling with colored light. Hot cathode gaseous conductor tubes are used as sources, the brilliant primary colors blending into intermediate secondaries and combining into synthetic white at the seating level.

Oliver Ajer of General Electric research laboratory demonstrated the principle by which brief flashes from neon or mercury-vapor tubes, lasting only a few millionths of a second, can be used for studying the behavior of turbine disks or other bodies revolving at high speed, as well as for some surprising optical illusions.

Charles Poey cited data showing that every kilowatt added brought an average annual revenue of $63.15 at a cost of less than one-third of that amount.

Active measures are in progress with co-operation of state factory inspectors to bring factory lighting codes up to date. A definite incentive toward that end has been suggested in the form of a rebate to employers on compensation insurance if illumination meets a certain standard.

COMING MEETINGS

National Association of Railroad and Utilities Commissioners — Annual meeting, Washington, D. C., November 12-15. James B. Walker, 270 Madison Avenue, New York.

American Physical Society — Annual meeting, Washington University, St. Louis, Mo., November 30-December 1. W. L. Severinghaus, secretary, Columbia University, New York.

American Society of Mechanical Engineers—Annual meeting, New York, N. Y. December 3-8. C. E. Davies, assistant secretary, 29 West 39th St., New York.

American Engineering Council—Annual meeting, Washington, D. C., January 10-12. Frederick M. Feiker, executive secretary, 744 Jackson Place, N.W., Washington, D. C.

American Institute of Electrical Engineers—Winter convention, New York, N. Y., January 22-25. H. H. Henline, National Secretary, 29 West 39th Street, New York, N. Y.

Market Scope Broadened by Housing Program

At a regional meeting of the Federal Housing Administration held October 16 at the Hotel Roosevelt, New York, Ward Kennedy, of the public reserve office of the Federal Housing Administration, discussed the scope and possibilities of the market which will be opened by the national housing act. He directed the attention of the audience to the fact that the housing program puts 75 per cent of the money spent into wages, reducing the relief rolls, turning the money into private business channels, reducing government spending and, consequently, taxes.

As to its soundness from the purchaser's standpoint, he stated that prices are still at or below 1926 levels and persons who wish to profit should take advantage of them before an acceleration of activities raises prices. On a conservative basis of normal building, in the ten years preceding 1929, three to four hundred thousand homes were built per year. Due to the cessation of building during the last four or five years there is a shortage of 1,500,000 homes. It will take five years to replace this vacuum and the country will still be five years behind on normal building.

Less attention should be directed toward the philanthropic and altruistic side of the program, declared Roger Steffan, director of modernization credit, Federal Housing Administration, and more attention should be directed toward the satisfaction of making homes more attractive to live in. Based on experience with a company which has made 560,000 loans amounting to $160,000,000 to wage earners, only 10 per cent of whom were property owners, a loss of only one-quarter of 1 per cent occurred. On this basis the speaker expressed the opinion that the American wage earner is the best credit risk.

Dr. Compton Makes Appeal for Support of Foundations

An appeal for the support by men of wealth for foundations and other educational agencies working for the betterment of national and human welfare was made last week by Dr. Karl T. Compton, president of the Massachusetts Institute of Technology, in an address at the twentieth anniversary dinner of the Engineering Foundation. The dinner, held at the Union League Club, New York, was in honor of Ambrose Swasey, noted inventor, who established the foundation and who will celebrate his eighty-eighth birthday anniversary in December.

"Either government support or private endownments by men of wealth must foster the work of progress which is being made through science and educational agencies," Dr. Compton said. "There are few modern influences so important to human welfare as foundations," he continued. Dr. Compton stated that tremendous opportunities for service beckon the foundations, particularly in fields of science and engineering.

EVENTS IN WASHINGTON

P.W.A. has advised William J. Lucks, Columbus, Ohio, director of Public Service, to withdraw the city's application for a grant to aid in financing construction of an addition to the municipal electric light plant. Under the new ordinance fixing the rates for service by the Columbus, Railway, Power & Light Company, effective for five years from November 15, if approved by the electorate November 6, the consumer would have nothing to gain from the company's service to the municipal, according to an announcement by H. P. Hunt, chairman of the P.W.A. electric power board of review. Under the new ordinance the rates fixed for residential service by the company are lower than the present rates of the municipal system and the rates for commercial service are approximately the same.

Publication of a purported synopsis of a report by the Natural Resources Board was described at the board's offices as the figment of some one's imagination. It was admitted that the report is in final form and will be sent to the President in the near future. Published statements were to the effect that the report recommended the setting up of authorities similar to T.V.A. in several of the larger river basins.

California interests have appealed to the President in their effort to get Public Works funds for the Central Valley development. Public Works Administrator Ickes feels that Congress must define clearly its attitude toward federal authority on non-navigable streams before such an advance could be made.

PAUL WOOTON,
Washington Correspondent.

Ohio Brass Opens New Laboratory

Inauguration of joint structure at Barberton largely attended — To be placed at disposal of utilities

Ability to co-ordinate high-voltage tests of both the indoor and outdoor structural type marks the new joint laboratory inaugurated at Barberton, Ohio, by the Ohio Brass Company on October 18, 1934. The occasion was marked by the attendance of 350 members of the Akron, Cleveland, Toledo and Fort Wayne sections of the American Institute of Electrical Engineers and others from Ohio and nearby states. In the indoor laboratory it will be possible to make impulse tests up to 2,000,000 volts by means of the new helically arranged impulse generator.

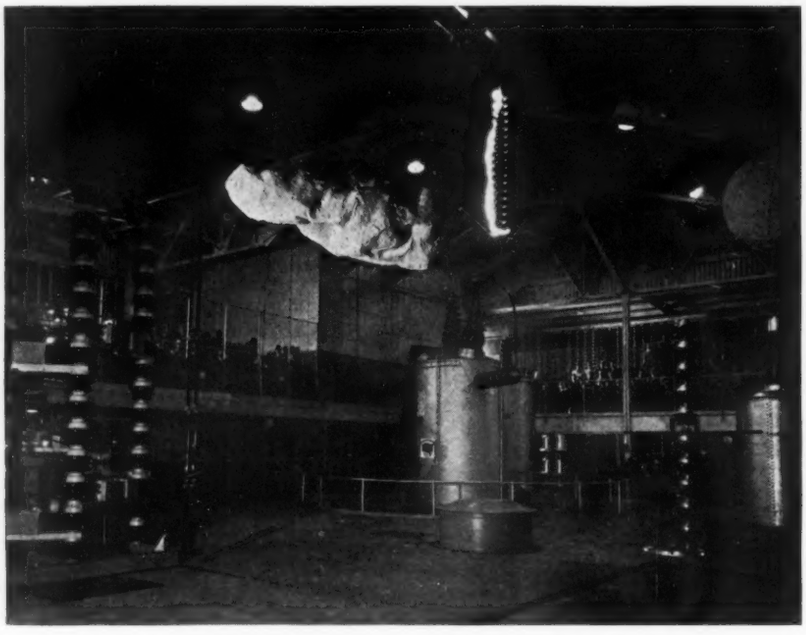
For outdoor tests on characteristic structures tests up to 3,000,000 volts can be made by adding a supplementary stack section to the generator before it is moved outdoors on its tracks. Indoor tests can also be made up to 1,250,000 volts at commercial frequencies by cascade connection of the first two units of the three 750,000-volt transformers, which in combination will permit tests at 2,000,000 volts outdoors. A third element in the indoor laboratory is the 750,000-volt high-frequency generator which enables insulation studies to be made at from 50,000 to 100,000 cycles.

Announcement was made that both indoor and outdoor laboratories will be placed at the disposal of utilities for impulse, co-ordination, protection and grounding studies, in connection with new designs of supports and any problems of rehabilitation of existing lines. The outdoor laboratory is provided with tracks and cars, upon which are mounted the typical structures used or contemplated for line supports. These can be moved into position for application of either the 3,000,000-volt impulse tests or the 2,000,000 volts at the three prevailing commercial frequencies, 25, 50 and 60 cycles.

Time lag deserves notice

Incidental to a working demonstration of the impulse equipment J. T. Lusignan, chief electrical engineer, emphasized the point that time lag of all components of insulation should be given more consideration than is usually accorded it in co-ordination studies. Another point made was that insulation and protection should be so co-ordinated as to meet impulse of either polarity with equal success.

To illustrate these items a demonstration was given of a bushing and a paralleled gap in which the bushing flashed over under negative impulse and the gap under positive impulse of the same voltage. Also when the impulse was positive and of long duration the rod gap flashed over, whereas with high overvoltage the protective value of the gap is lost because of its greater time lag, the bushing in this instance flashing over before the gap could.



New high-tension laboratory inaugurated at Barberton, Ohio

Facilities for tests indoors on bushings and insulators and outdoors on typical line structures up to 2,000,000 volts at commercial frequencies, 3,000,000 volts impulse and 750,000 volts at high frequency are provided. This pictures a 2,000,000-volt spill cascading over a long string. Subsequent tests demonstrated polarity discrimination in lighting by means of the two "clouds" in the foreground. Impulse stack at left, 750-kv. transformer in background, bushing tank at right.

City Utility Tax Upheld by Court

Buckley act permitting last year's levy declared constitutional by Supreme Court Justice Schmuck

Constitutionality of the Buckley act under which the city of New York imposed a tax of 1½ per cent of the gross monthly income of public utilities from September 1, 1933, to February 20 last was upheld last week by Supreme Court Justice Schmuck. Corporations affected by the tax paid it under protest and some of them joined with the New York Steam Corporation in bringing an action to upset the law and compel the return of the taxes.

Justice Schmuck recited that the plaintiff and other corporations had attacked the law on the ground that the city was usurping a power delegated only to the Legislature, and also assailed the constitutionality of the act on allegations that it was not passed by two-thirds vote of both houses of the Legislature. The court pointed out that the act "merely authorized the adoption of local laws through local legislative bodies imposing any tax which the Legislature has or would have the power to impose.

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Commissioners to Discuss Utility Regulation

The forty-sixth annual convention of the National Association of Railroad and Utilities Commissioners will be held at the Willard Hotel, Washington, D. C., November 12 to 15. The program for the convention will be wholly devoted to the most important problems of regulation and will include discussions on the Johnson bill, limiting the jurisdiction of the lower federal courts in cases involving the validity of state commission orders, and on valuation, and the effect of recent judicial decisions on the determination of the rate base.

Among the prominent speakers will be William E. Lee, chairman of the Interstate Commerce Commission; Frank R. McNinch, chairman of the Federal Power Commission, and E. O. Sykes, chairman of the Federal Communications Commission.

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A.S.T.M. Elects Officers

Dr. Herman von Schrenk, consulting timber engineer, St. Louis, Mo., has been elected president of the American Society for Testing Materials. This action was taken by the executive committee to fill the vacancy caused by the death of W. H. Bassett, who died July 21, soon after he took office as head of the society. The vacancy created by Doctor von Schrenk's election was filled by the ap-

pointment of H. S. Vassar, laboratory engineer Public Service Electric & Gas Company, Newark, N. J., as senior vice-president. A. C. Fieldner, chief engineer experiment stations division, U. S. Bureau of Mines, has been elected junior vice-president. No action was taken to fill the unexpired term of Mr. Fieldner as a member of the executive committee.

Danville Election Denied

In a decision handed down last week Judge Henry G. Leigh of the Danville, Va., Corporation Court determined that voters cannot pass upon the $2,225,000 bond issue for the Pinnacles hydro-electric power project inasmuch as a period of twelve months has not passed, as required by law, since a previous election on a similar issue had been held. The proposal was defeated last February. A. M. Aiken, city attorney of Danville, Va., has been instructed by the City Council to proceed with mandamus proceedings before the Virginia State Supreme Court of Appeals to compel Judge Leigh to issue the writ of election.

Tritle and Drury Receive McGraw Awards

Manufacturers and Wholesalers Associations Both Pay Tribute to the Men Who Have Led Them in Developing Self-Government Under Their Codes

TWO national associations of the electrical industry, at their conventions, held the same week, honored the men who have led the struggle for self-government under the codes, by selecting them for the James H. McGraw Award. On October 16, in Detroit, Walter J. Drury, chairman of the executive committee of the National Electrical Wholesalers Association, received the electrical wholesalers' medal for 1934 and on October 19, in Chicago, the electrical manufacturers' medal for 1934 was presented to John S. Tritle, president of the National Electrical Manufacturers Association.

Under the terms of the award both associations appoint committees of judges to select for the award that individual who has made the most outstanding contribution to the advancement of these two branches of the electrical industry. For N.E.W.A. the selection was made by J. L. Buchanan, B. W. Clark, W. J. Kranzer, L. E. Latham and D. E. Tolles. For N.E.M.A. the committee consisted of F. C. Jones, G. O. Mason, D. G. Phelps, E. O. Shreve and W. E. Sprackling. In each case the award was given to the man who has headed the industry through this difficult period of code making and reorganization which followed the enactment of the National Industrial Recovery Act. It offered a welcome opportunity to give recognition and express appreciation to these two men who—each in his own way—have given so unselfishly of their time, thought and energy in serving their industries in this critical time, far beyond the measure of their official obligation.

The awards were presented by Earl Whitehorne, in behalf of the committee of awards, with the following citations:

W. J. Drury

CITATION TO DRURY

Walter J. Drury, eastern district manager for the Graybar Electric Company, was chairman of the executive committee of the National Electrical Wholesalers Association when the National Industrial Recovery Act made him responsible for the development of a code of fair competition for the electrical wholesaling industry and the organization of all the electrical distributors of the country behind a program of self-government. The job entailed the determination of the needs and desires of this large group of widely scattered local merchants, the consolidation of their objectives and the protection of their interests in their relation with the wholesalers of other industries, under the basic code.

By his sound and deliberate judgment, his unfailing fairness and patience, his instinctive diplomacy and fine spirit of co-operation, his generosity of time and thought and, above all, his persistent and aggressive leadership through this protracted period of negotiation and planning, he has inspired a new unity in the industry and achieved a progress toward a practical co-ordination in the business of distributing electrical appliances and supplies that promises a lasting benefit.

J. S. Tritle

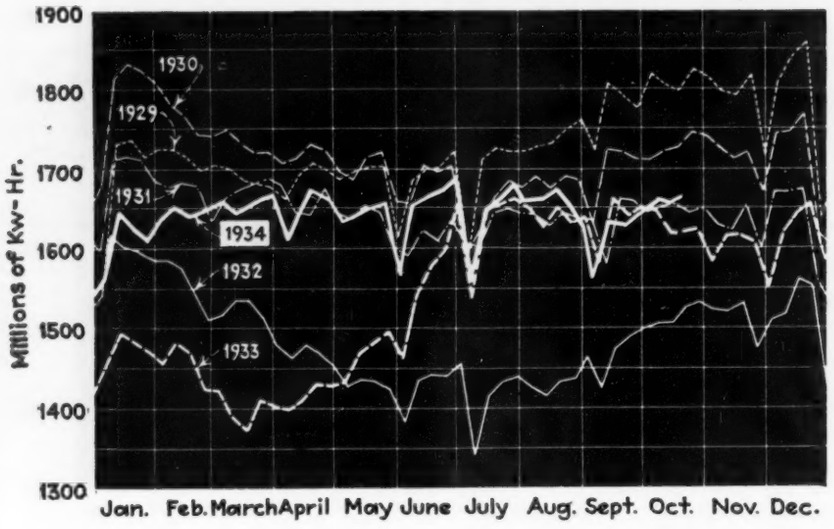
CITATION TO TRITLE

John S. Tritle, vice-president of the Westinghouse Electric & Manufacturing Company, as president of the National Electrical Manufacturers Association, found it his responsibility to undertake the organization of the electrical manufacturing industry under the National Recovery Administration. He saw in it not just an obligation to preside in the formulation of a code of fair competition but an opportunity to give constructive direction to the establishment of a sound basis for industrial self-government in America.

By his tireless effort, unfailing patience, impartial fairness and inspiring leadership he marshalled the strength of the industry behind a program of co-ordination that produced one of the most effective codes evolved under the National Industrial Recovery Act and one of the earliest to receive approval. Throughout this difficult period of conflict and confusion he has maintained the solidarity of the electrical manufacturers and strengthened the influence of organization procedure. He has advanced the welfare of the entire electrical industry by his wise and courageous handling of labor problems in his own company, and later by his able service on the Durable Goods Committee has helped guide, for all industry, the course of readjustment following the codes.

Throughout this exhaustive and perplexing work, performed at a great personal sacrifice, he has fought for the protection and progress of the broad interests of electrical manufacturing, with a dignity and courage that have won him the gratitude and loyal support of all who have worked with him.

Output Again Surpasses 1933



Continuing the general upward movement that has been in progress since the middle of September, the energy output of central stations rose during the week ended October 20 to 1,667,505,000 kw.-hr., compared with 1,656,864,000 kw.-hr. in the preceding week according to the Edison Electric Institute. Thus the ground lost during the latter part of August and early September has been virtually recovered.

Recent changes have been in favorable contrast with those occurring at this season a year ago, when the trend was definitely downward; the margin of increase over 1933 has been widening and now stands at 3 per cent.

The rise has been general throughout the country, New England alone reporting less production than last year, although the gap caused by the textile strike is closing. In the South a loss of 6.2 per cent a month ago has been turned into a gain of 9.2 per cent. In the Central industrial area a gain follows eight weeks' deficiency.

Weekly Output, Millions of Kw.-Hr.

1934		1933		1932	
Oct. 20	1,668	Oct. 21	1,619	Oct. 22	1,528
Oct. 13	1,657	Oct. 14	1,619	Oct. 15	1,508
Oct. 6	1,659	Oct. 7	1,646	Oct. 8	1,506
Sept. 29	1,649	Sept. 30	1,653	Oct. 1	1,499
Sept. 22	1,631	Sept. 23	1,639	Sept. 24	1,491
Sept. 15	1,634	Sept. 16	1,663	Sept. 17	1,476

Per Cent Change from Previous Year

Region	Week ended Oct. 20	Oct. 13	Oct. 6
New England	− 4.4	− 3.3	− 4.6
Middle Atlantic	+ 3.0	+ 2.8	+ 2.0
Central Industrial	+ 1.3	− 0.8	− 0.9
West Central	+ 5.6	+ 6.5	+ 6.4
Southern States	+ 9.2	+ 5.2	− 0.6
Rocky Mountain	+ 7.3	+ 3.6	+ 1.4
Pacific Coast	+ 4.6	+ 9.2	+ 7.0
United States	+ 3.0	+ 2.3	+ 0.8

More Growth in Foreign Lands

Supplementing the reports of rising energy output in various foreign countries, quoted in the ELECTRICAL WORLD of September 29 from "Foreign Trade Notes," comes further evidence of a world-wide upward trend. In Poland production during the first half of 1934 gained 15 per cent over the corresponding period of the preceding year. In Sweden the gain for the second quarter was 12.5 per cent. For Portugal the latest statistics relate to 1933; they show 5.4 per cent more output than in 1932. South Africa had an increase, for the same two years, of 9.4 per cent.

Though most of these are countries having a comparatively small population, several are fairly heavy users of electrical energy. The half-year figure for Poland is about 1,285,000,000 kw.-hr.; the quarter for Sweden, 1,092,000,000 kw.-hr. Total sales in South Africa during 1933 were 974,000,000 kw.-hr., and in Portugal the total energy generated during that year was 302,000,000 kw.-hr. Of the latter, 83 per cent came from public utility plants. Slightly more than two-thirds of the total was produced by steam and internal combustion engines. The number of consumers in that country in 1933 was 233,025, about 4 per cent more than in 1932, and there were 569 plants aggregating 206,998 kw.

Even in far-off New Zealand the load is increasing. In the last fiscal year the peak on her largest hydro plant (at Arapuni) came within a few per cent of the 60,000 kw. rated capacity and it has been decided to increase this to 90,000 kw.

•

Canadian Output Up 10%

Output of central stations in Canada is leaving depression levels far behind. Amounting in August to 1,658,742,000 kw.-hr., it not only exceeded the July figure by 2.3 per cent but surpassed last year's August production by 10 per cent and that of the like month in 1932 by nearly 35 per cent. A remarkably large portion of the energy goes to electric boilers, which in August used 351,103,000 kw.-hr., or about 21 per cent of the total production.

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B. J. Carney Awarded T.V.A. Pole Contract

B. J. Carney & Company, Minneapolis, has received the contract from the Tennessee Valley Authority for Western red cedar poles which will be used in the transmission line of the Norris-Wilson Dam project. In addition to the Norris-Wilson Dam transmission line, the Tennessee Valley Authority has been purchasing Western red cedar for Mississippi points from the Carney organization. William Mueller, Jr., who for several years was associated with William Mueller & Company, Carney representative in Chicago, has opened an office in Chattanooga, Tenn., to handle the Southern and Southwestern territories for B. J. Carney & Company.

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General Electric Sales Increase 25 per Cent

Sales billed by General Electric Company during the first nine months of 1934 amounted to $121,735,122, compared with $97,426,146 during the corresponding period last year, an increase of 25 per cent, President Gerard Swope has announced.

Profit available for common stock for the first nine months of this year was $11,714,247, compared with $6,886,600 for the first nine months of last year. This profit is equivalent to 41 cents a share for the first nine months of 1934 and 24 cents a share for the first nine months of 1933, on 28,845,927 shares outstanding in both periods. Dividends declared for nine months this year amount to 45 cents a share, compared with 30 cents a share for the corresponding period last year.

Orders received during the first nine months of 1934 amounted to $132,613,543, compared with $104,785,001 for the nine months last year, an increase of 27 per cent.

New York Metal Prices

	Oct. 9, 1934 Cents per Pound	Oct. 23, 1934 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.60	3.70
Antimony	9.00	9.625
Nickel ingot	35.00*	35.00
Zinc, spot	4.225	4.20
Tin, Straits	50.625	51.20
Aluminum, 99 per cent	23.30	23.30

*Blue Eagle.

Westinghouse Receives Large Transformer Order

Amounting to approximately $1,000,000, the largest single order for transformers placed in the last five years has just been awarded to the Westinghouse Electric & Manufacturing Company by the Bureau of Power and Light of the city of Los Angeles. Seven 65,000-kva. transformers, to be installed at the Los Angeles terminal of the 287,000-volt transmission line, originating 285 miles distant at Boulder Dam, are included in the order. The units will be arranged in two banks of three each, with one held available for stand-by service. They will step down the incoming high voltage to 132,000 volts, at which voltage it will be fed into the distributing ring supplying electrical service to Los Angeles and the surrounding territory.

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Code Authority Selected by Wholesale Trade

The Electrical Wholesale Trade has recently elected the following members of the Code Authority: G. E. Cullinan, Graybar Electric Company, New York, chairman; C. C. Davis, C. C. Davis Electric Company, Philadelphia, vice-chairman, and E. Donald Tolles, New York, executive secretary. Other members include: J. L. Buchanan, General Electric Supply Corporation, Bridgeport; B. W. Clark, Westinghouse Electric Supply Company, New York; F. R. Eiseman, Revere Electric Company, Chicago; H. A. Esler, Missouri Valley Electric Company, Kansas City; N. W. Graham, Graham Reynolds Electric Company, Los Angeles; L. L. Hirsch, Electrical Supply Company, New Orleans; J. C. McNamara, Smith-Perry Electric Company, Dallas, and H. O. Smith, Hardware & Supply Company, Akron.

At a recent meeting of the Code Authority by-laws were adopted and a budget approved for administration of the code.

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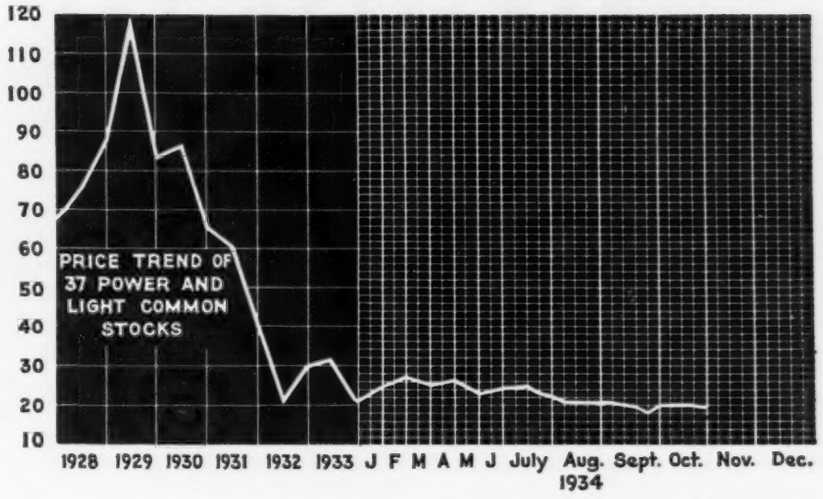
Cutler-Hammer Shipments

Shipments of Cutler-Hammer, Inc., for the quarter ended September 30 totaled $1,141,642, against $1,497,490 in the previous quarter and $1,170,512 in the third quarter of 1933. For the nine months ended September shipments amounted to $3,814,906, against $2,607,452 in the corresponding period last year.

Stocks Decline Slightly



Dull sessions in the financial markets occasioned few price changes of any significance. A slight decline in electric light and power shares brought the *Electrical World* index down to 19.7, compared with 20.2 last week

Merchants Society Enlists Services of Electrical Men

Sensing the need for a more closely knit organization among business men which could exercise greater influence in opposing modern tendencies which are detrimental to business, the Merchants' Association of New York is staging a drive to increase its membership. F. A. Ketchum, president of the Graybar Electric Company, Inc., has taken the chairmanship of the electrical section and H. H. Barnes, Jr., vice-president of the General Electric Company, is serving as assistant chairman. Associated with Mr. Ketchum and Mr. Barnes are T. R. Langan of the Westinghouse Electric & Manufacturing Company; G. E. Stewart, president of L. K. Comstock & Company, Inc., and H. C. Callahan of the General Electric Supply Corporation.

The campaign is being carried on under the general chairmanship of Malcolm Muir, president of the McGraw-Hill Publishing Company, Inc.

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British Output Increases

Continuing the substantial gains of recent months, the output of electricity in the United Kingdom during the month of September totaled 1,042,000,000 units, according to official returns submitted to the British Electricity Commission by authorized undertakers. This figure compares with 1,059,000,000 units in August and 1,023,000,000 units in September, 1933. During the first nine months of 1934 the total amount of electricity generated was 10,873,000,000 units, compared with 9,359,000,000 units for the corresponding period of 1933, representing an increase of 16.1 per cent.

Current Earnings Reports

Operating Companies

	1934	1933
Carolina Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings	$9,508,972	$9,041,690
Net balance	47,343*	380,572*
Detroit Edison (Year ended Sept. 30)		
Gross earnings	44,178,626	41,767,073
Net balance	6,969,596	6,552,029
Duquesne Light (Year ended Aug. 31)		
Gross earnings	25,191,985	23,833,573
Net balance†	10,174,856	10,977,196
Kansas City Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings	14,584,640	14,336,240
Net balance†	3,309,337	3,433,338
Montana Power (Year ended Aug. 31)		
Gross earnings	8,657,300	8,660,761
Net balance	119,805	674,765
Puget Sound Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings	13,047,302	12,645,617
Net balance	1,507,321*	635,315*
Utah Pwr. & Lt. (Year ended Aug. 31)		
Gross earnings	9,753,117	9,732,260
Net balance	1,139,994*	564,046*
Virginia Elec. & Pwr. (Year ended Aug. 31)		
Gross earnings	14,988,362	14,737,718
Net balance	1,474,277	2,256,414

Holding Companies

	1934	1933
Amer. Gas & Elec. and subs. (Year to Aug. 31)		
Gross earnings	$66,664,086	$62,850,136
Net balance	7,424,526	7,848,860
Amer. Pwr. & Lt. and subs. (Year ended Aug. 31)		
Gross earnings	74,685,717	73,063,608
Net balance	3,157,080	5,881,144
Electric Pwr. & Lt. and subs. (Year ended Aug. 31)		
Gross earnings	72,343,935	68,925,277
Net balance	480,109*	39,867*
Engineers Pub. Serv. (Year to Aug. 31)		
Gross earnings	43,714,061	43,006,068
Net balance	1,435,818*	346,833
National Pwr. & Lt. and subs. (Year ended Aug. 31)		
Gross earnings	71,115,104	68,569,066
Net balance	6,787,458	7,487,800
Philadelphia Co. and subs. (Year ended Aug. 31)		
Gross earnings	47,511,100	45,340,450
Net balance†	7,834,637	7,845,428

*Deficit. †Available for all dividends.

Gross earnings—(Operating Companies) Gross operating revenue. (Holding Companies) Gross operating revenue plus other income. Net balance—Balance available from income for common stock dividends.

Getting in Through Kitchen Window

By A. M. HILDEBRAND
General Superintendent
Lake Erie Power & Light Company,
Sandusky, Ohio

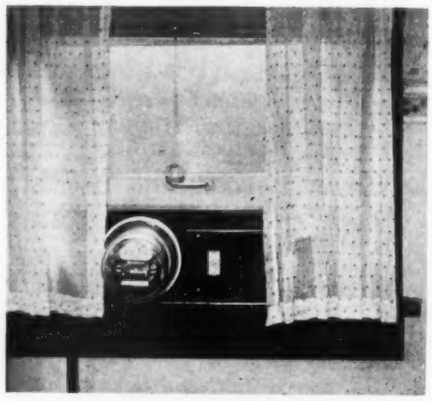
Unwired rural homes have been hard to sell by the conventional methods in the Lake Erie Power & Light territory. So a method was devised whereby they sell themselves on lighting, cooking and water heating without initial outlay for wiring or service extension.

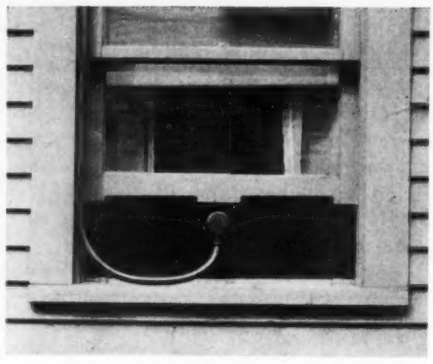
A survey of the rural territory by E. R. Mann, commercial manager, disclosed many unwired homes close to the primaries and often close to existing secondaries. Each represented a potential annual revenue of $50. Our plan to win these customers is to give them service in such form as to allow the use of all types of electrical equipment for a short trial period. The approach was as follows:

Some representative (district manager, salesman, meterman or lineman) stops at the home when in the vicinity and offers free service and free use of appliances for, say, two weeks. At the end of the period the service and equipment will be removed if not wanted without obligation of any kind.

In the first year twenty demonstrations were made. Two indirect floor lamps, one regular floor lamp, one bridge lamp, one iron, one sweeper and one radio were placed at the disposal of the prospect. In several cases washing machines, refrigerators and ranges were placed. Seventeen of these were converted to signed applications before it was time to remove the equipment. Complete wiring jobs and complete installations of merchandise resulted, with double the amount of merchandise sold to the ordinary newly wired job.

The demonstration service itself cost approximately $30. Electrical appliances represented an outlay of about $75 on the average. The capital tied up was thus just over $5 per demonstration per year. Connecting the service to the house with temporary line drop cost approximately $25. This cost was absorbed in operation by the seventeen permanent installations. The three others were charged to commercial expense. Installing the demonstration panel and utilization equipment cost about $5 per demonstration. Instead of $50 per year, the revenue has averaged nearer $70, and thus about $1,190 revenue was obtained from an expenditure of $483. In addition sales of merchandise came to $3,500. None of the seventeen customers have been delinquent in payments. Yet these were customers who had largely been given up as hopeless prospects.





Hesitant home served through the window

Temporary service to the unwired home affords chance for customer to sell himself by trial. Service entrance cable runs to adjustable metal panel set in window. Kitchen side carries meter, breaker and socket for cabled service leads to lamps and appliances. Trial installations are 85 per cent successful.

Results with these small appliance demonstrations were so encouraging that the F. W. Wakefield Company of Vermilion, Ohio, was called upon to revamp the window panel demonstrator for 60 amp. capacity and thus open trials to ranges. The meter in the demonstrator tells the customer what the cost is on the 3-cent rate. So far every range demonstration has meant a sale, and to people who have been resistant for years. Along Ohio's lake shore the scheme of installing a meter, circuit breaker and main socket outlet in a window panel along with plugged-in portable cable for the trial lighting and appliances has won customers where no other approach of comparable cost had succeeded.

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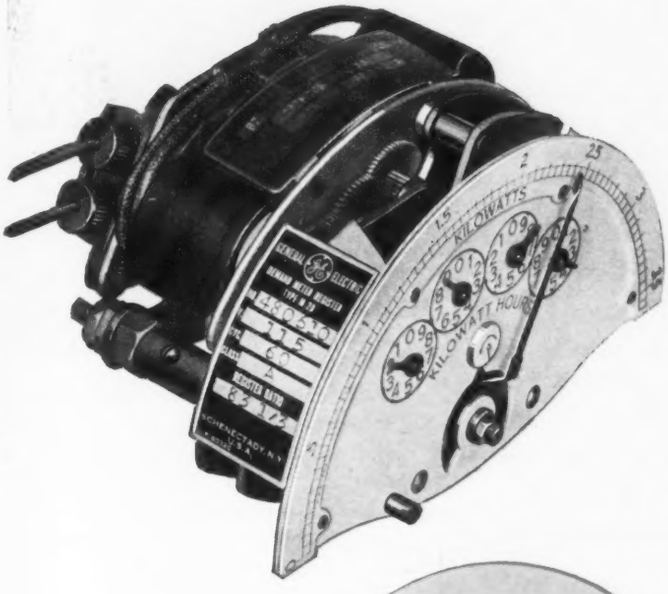
A Compromise With Underground

Where overhead construction is seriously objectionable and the density of load does not economically justify the investment in underground construction, some compromises are available that give some of the advantages of underground construction without imposing so severe an investment burden. For example, one-half to two-thirds of the distribution system of one city is a combined underground-overhead system. This construction is employed where the city provides rentable duct lines on alternate east and west streets for 4-kv. mains and where alleys or back-property-line space are available for secondaries.

On each street having underground mains three-conductor cables are brought out opposite each alley on both sides of street and continue as risers up transformer poles at these points. From these poles secondaries are run in the open one block up each alley. Thus each block is served by one transformer and its independent secondary. No secondaries are on streets and none cross streets. Three-conductor cables are favored for these pole taps, even though single-phase secondaries are used, as the extra conductor affords a simple means of providing a reserve circuit and also

6 Reasons Why

the new M-20 demand register will save you money . . . . .



1 More reliable timing through the use of an improved type of Telechron motor.

2 Your meter man can obtain an over-all accuracy check in a minute. Unique checking device, a part of the register design, saves time and labor.

3 Testing is made easier and time is saved by a new interval indicator and clutch. The indicator shows at a glance the timing of the interval. The clutch permits setting to zero without waiting for the device to complete a cycle, and makes possible the quick over-all accuracy check.

4 Simple adjustments make servicing easy and assure the highest accuracy. They are an essential part of good design.

5 Built to last. Parts are of corrosion-resistant materials; all bearings are permanently located; plates are rigidly spaced and locked.

6 Maximum protection against abnormal conditions is provided by the "follow-up" type of reset mechanism—inherently reliable.

Look to the M-20 for Accuracy and Service

May we send you complete information? General Electric Company, Dept. 6A-201, Schenectady, New York.

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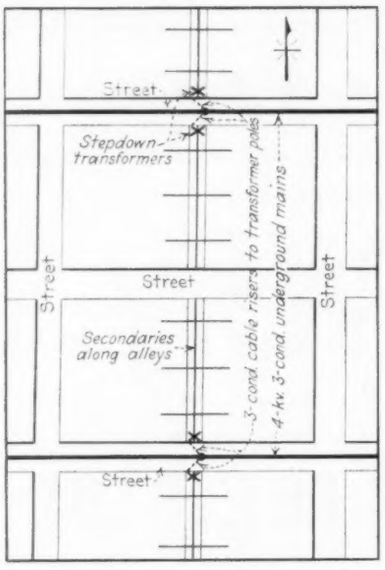


Open secondaries in alleys, underground mains in alternate east and west streets

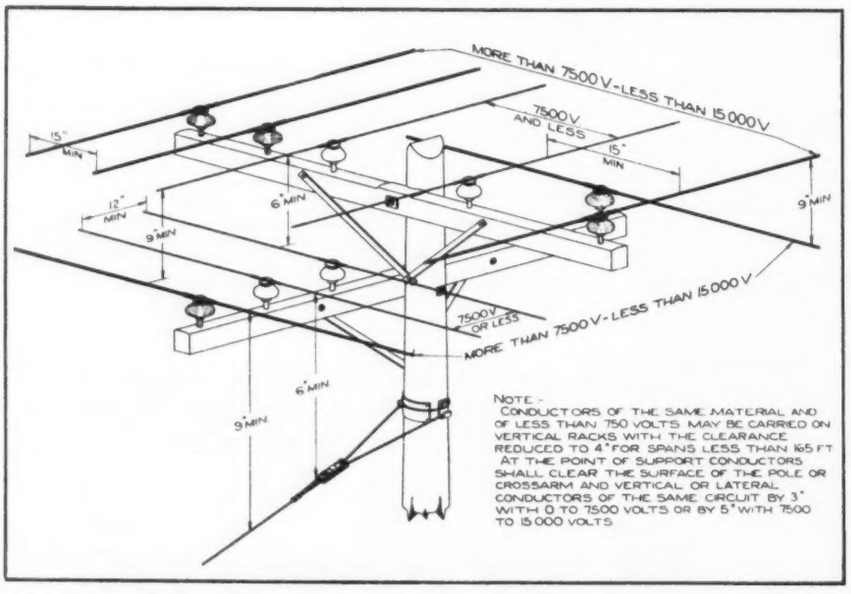
provides for the day when three-wire service is necessary without great anticipatory investment.

The chief problem with this construction has been the connection of the risers to the transformers. Potheads rated at less than 7½ kv. have such small clearances between terminals that birds can easily cause short circuits. Higher voltage potheads were considered too expensive as the semi-underground system already imposed extra expense over open-wire construction.

Several methods are being considered for making the taps, all involving the use of lead-sheathed "Kerite" or rubber-base insulated cable whose conductors are fanned "out" at the point of attachment. Because of the insulation used, the crotch is only taped and not otherwise protected. Each conductor terminates on one of three pin insulators. In all cases the riser is protected by a fiber tube, but it has been considered whether the cable should be made to follow the crossarm from the pole attachment and inclosed in fiber slotted at three places for emergence of the individual conductors, or whether the individual conductors should be run open from the top of the riser to the insulators.

A fuse box is placed between each outside insulator and the center insulator so each lead can be easily attached to either of two cable conductors. How these disconnectable attachments should be made is a question. One method tried involves a male-and-female joint held by a set-screw and taped, but the tape must be removed to loosen the set-screw. Another scheme tried is a male-and-female joint which is snug enough to give good contact without auxiliary means. The female section is taped and can be slipped off and transferred to an adjacent conductor in an emergency. The male part of the joint on the unused conductor is covered by a fiber tube which can be removed readily if the conductor must be called into service.

Clearances at Supports on Poles


MORE THAN 7500 V-LESS THAN 15000 V
7500 V AND LESS
15" MIN
15" MIN
12" MIN
9" MIN
6" MIN
9" MIN
7500 V OR LESS
MORE THAN 7500 V-LESS THAN 15000 V
6" MIN
9" MIN
NOTE - CONDUCTORS OF THE SAME MATERIAL AND OF LESS THAN 750 VOLTS MAY BE CARRIED ON VERTICAL RACKS WITH THE CLEARANCE REDUCED TO 4" FOR SPANS LESS THAN 165 FT AT THE POINT OF SUPPORT CONDUCTORS SHALL CLEAR THE SURFACE OF THE POLE OR CROSSARM AND VERTICAL OR LATERAL CONDUCTORS OF THE SAME CIRCUIT BY 3" WITH 0 TO 7500 VOLTS OR BY 5" WITH 7500 TO 15000 VOLTS

Standard specifications for clearances at supports are of great assistance to the lineman when he is called upon to add new circuits. Here are West Penn specifications for use up to 15,000 volts.

Lamp Guard Resists Mob Attacks

By JAMES G. FITZGERALD
Blackstone Valley Gas & Electric Company, Woonsocket, R. I.

During the recent textile strike at Woonsocket, R. I., a mob attacked the mill of the Rayon Company and smashed 40 out of 46 1,000-cp. whiteway type lamps on a local circuit.

Home-made street lamp guard resists mob attack

Apprehending the attack, six guards like the one illustrated were made up at a local tinsmith shop to protect the street-lighting unit adjacent to the mill.

The guards were made up of screens built out of 1-in. wire mesh, spot-welded to rings at top and bottom and coated with aluminum paint. The lamps thus equipped survived the assault of the mob notwithstanding the barrage of bricks, stones and other missiles which raised havoc with some of the mill windows.

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Securing Reliable Ground Connections

When iron pipes are used for grounds some companies face the difficulty of driving them into hard ground and securing a good electrical connection for the ground wire. Both problems have been overcome by one company as follows: One end is threaded to receive a malleable iron driving point. Soldering or brazing the ground lead into or onto a galvanized pipe was found difficult. However, by wire-brushing the inside of the pipe for about 6 in. down from the top,

1 FASTER OPERATION

2 GREATER CAPACITY

3 LESS MAINTENANCE

THESE ARE THE BENEFITS OF ADDING OIL-BLAST TO YOUR G-E BREAKERS

BE ON the safe side. Add oil-blast action to your G-E breakers and prepare them for increased duty. With the upturn of business, be assured of adequate protection when more of the generating capacity of your system will be utilized. Besides, there are the benefits of better operating characteristics that the oil-blast principle of arc interruption provides.

You can modernize your old G-E breakers quickly and easily and at considerably less than the cost of new breakers. To install oil-blast baffles takes only a little more time, in most cases, than that required to make a periodical inspection of contacts and oil. In return, you gain improved breaker performance. One company has modernized nearly a hundred of its G-E breakers in the last three years. It was not necessary to make changes in the masonry cell structures, and in many cases the interrupting rating was doubled.

The addition of oil-blast makes arcing time more consistent and very much shorter. The amount of increase in interrupting ability depends on the type and rating of the breaker. Ask one of our switchgear specialists to point out the advantages *you* will get by adding oil-blast action to *your* breakers. General Electric, Schenectady, N. Y.

NRA U.S. WE DO OUR PART

810-42

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inserting a cork just below this level, sticking the end of the ground wire into this cork, heating the upper part of the pipe, and pouring molten solder in the cavity formed, a satisfactory electrical bond was obtained.

While a true amalgamation of metals did not occur between pipe and solder, a very intimate contact was secured. This was considered sufficient in view of the large contact area so long as no moisture penetrates the bond to start chemical change of the contact surfaces. Such action is avoided by leaving a small cavity above the solder into which hot asphalt is poured.

Galvanized pipe is purchased in 20-ft. lengths and cut into 8-ft. ground rods, the odd lengths being salvaged for nipples. The cost per ground rod is about 43 cents for pipe and points alone.

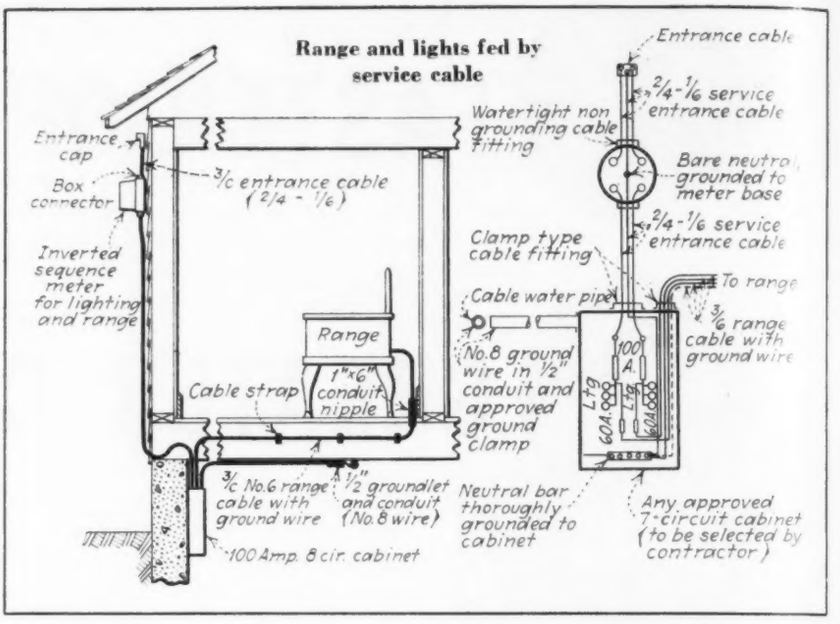
While this amounts to 69 cents saving per ground rod over the former practice, this company has found that galvanized pipe does not last very long where the ground has to be salted, due to corrosion. As a result it may have to go to copperweld ground rods.

The driving points cost only about 3 to 4 cents apiece, which may be more than the cost of labor for crushing the end to form a chisel effect, but were found more satisfactory for hard ground. Use of clamps was also investigated, but the cost of purchasing and installing them was found higher than soldering. However, if it is necessary to disconnect the ground wire periodically there is no question but that the clamp would be cheaper.

•

Avoids Corrosion Under Fireproofing

Cable-sheath corrosion has frequently been experienced under cement fireproof coverings where cheese cloth to which hot paraffin has been applied is used to separate the sheath and cement. It is not evident why this construction should cause corrosion, but one utility company has overcome the trouble by a slight modification. First, the sheath is painted with hot asphaltic compound and then a wrapping of cheese cloth is applied which is likewise painted with asphalt. The cement fireproofing is built up around the cable as usual.


Range and lights fed by service cable
Entrance cable
2/4-1/6 service entrance cable
Watertight non grounding cable fitting
Entrance cap
Box connector
3/c entrance cable (2/4 - 1/6)
Bare neutral grounded to meter base
2/4-1/6 service entrance cable
Clamp type cable fitting
Inverted sequence meter for lighting and range
To range
Cable water pipe
3/6 range cable with ground wire
Range
No.8 ground wire in 1/2" conduit and approved ground clamp
Cable strap
1"x6" conduit nipple
100 A.
Ltg
60A.
3/c No.6 range cable with ground wire
1/2" groundlet and conduit (No.8 wire)
Neutral bar thoroughly grounded to cabinet
Any approved 7-circuit cabinet (to be selected by contractor)
100 Amp. 8 cir. cabinet

Service-Entrance Costs Compared

By S. B. CLARK*
Northwestern Electric Company, Portland, Ore.

About $7.50 can be saved by using service entrance cable for range and lighting load in conjunction with inverted sequence outdoor metering. Adequate capacity is afforded by the 100-amp. switch. Five-conductor cable could be installed between the light-and-range meter and the main line cabinet at a very small increase over three-conductor No. 4. This would provide for future hot water service by the addition of a 30-amp. switch to the existing cabinet.

*Reported at Portland meeting of engineering section, Northwest Electric Light and Power Association.

Cost of Adequate Service Entrance for New Residence

A—Using Rigid Conduit

Item	No. Reqd.	Unit Cost	Extended Cost
Service			
1½-in. Conduit, ft.	15	$0.18290	$2.7435
1½-in. Conduit locknuts	2	0.03300	0.0660
1½-in. Conduit bushings	1	0.05450	0.0545
1½-in. LB Condulet	2	1.02900	1.0290
1½-in. Condulet blank covers	2	0.31360	0.6272
1½-in. Entrance condulet and cover	1	0.58600	0.5860
1½-in Pipe straps	5	0.01350	0.0675
No. 4 R.C. stranded wire, ft.	55	0.03815	2.0983
100 A. 7-cir. cabinet	1	(Price dependent on selection)	
Misc.—tape, solder, etc.	Job		.5000
Material			7.77
Labor			7.00
Range			
1-in. Conduit, ft.	15	$0.13520	$2.0280
1-in. Conduit locknuts	4	0.02150	0.0860
1-in. Conduit bushings	2	0.04150	0.0830
No. 6 R.C. stranded wire, ft.	50	0.02985	1.4925
Outlet box 4 1/16 x 4 1/16 x 2 1/2 in.	1	0.53600	0.5360
4 1/16-in. box cover, plain	1	0.21600	0.2160
Federal bushings	1	0.06000	0.0600
1-in. pipe straps	5	0.01030	0.0515
Misc.—tape, solder, etc.	Job	0.50000	0.5000
Material			5.05
Labor			3.00
Grounding			
½-in. Conduit, ft.	10	$0.07370	$0.7370
½-in. Conduit locknuts	2	0.00665	0.0133
½-in. Conduit bushings	1	0.01015	0.0102
½-in. groundlet	1	0.60000	0.6000
Ground jumper	1	0.2620	0.2620
No. 8 R.C. wire, ft.	12	0.01482	0.1778
Material			1.80
Labor			1.00
Total material			14.62
Total labor			11.00
Grand Total			**$25.62**

B—Using Service Entrance Cable

Item	No. Reqd.	Unit Cost	Extended Cost
Service			
Entrance Cap. No. 5536	1	$0.40000	$0.4000
3/c—Entrance cable (½-½), ft.	19	0.17000	3.2400
Box connectors No. 3206	2	0.21920	0.4384
1-in. Bx. box connector	1	0.15000	0.1500
100A. 7-cir. cabinet	1	(Price depends on selection)	
Cable straps	10	0.02720	0.2720
Misc.—tape, solder, etc.	Job		0.5000
Material			$5.00
Labor			5.00
Range			
3/c—No. 6 range cable, ft. (with gnd. wire)	17	$0.1440	2.4480
1-in. Conduit	1	0.1352	0.1352
1-in. Conduit bushing	2	0.0415	0.0415
Cable straps	10	0.0272	0.2720
1-in. Bx. box connector	1	0.1500	0.1500
Misc.—tape, solder, etc.	Job		0.2500
Material			3.30
Labor			2.00
Grounding			
½-in. Conduit, ft.	10	$0.07370	$0.7370
½-in. Conduit locknuts	2	0.00665	0.0133
½-in. Conduit bushings	1	0.01015	0.0102
½-in. Groundlet	1	0.60000	0.6000
No. 8 R.C. wire, ft.	12	0.01482	0.1778
Material			1.80
Labor			1.00
Total material			10.10
Total labor			8.00
Grand Total			**$18.10**

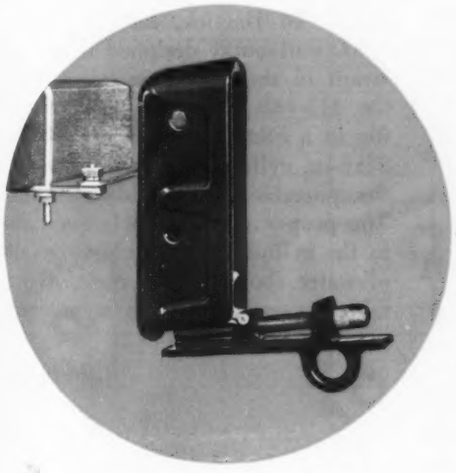
This G-E 2-in-1 Porcelain-Enclosed Cutout

GIVES POSITIVE INDICATION

(VISIBLE FROM GROUND)

Yet the Live Parts Are PROTECTED

INDICATING — When the fuse blows, the door pushes out at the bottom, giving clear indication to an observer on the ground, without exposing the live contacts and mechanism. The cutout may be mounted vertically or at an angle, and may be swivelled horizontally, thus providing for maximum visibility.



DROP-OUT — Perhaps for certain locations you would prefer the drop-out action. If so, all you have to do is remove a small wire yoke (no tools required), and the door drops open when the fuse blows.

This new 2-in-1 cutout is now available in ratings of 60 amperes, 5000 volts and 60 amperes, 7500/12,500 Gr. Y volts. Additional ratings are to be announced later.

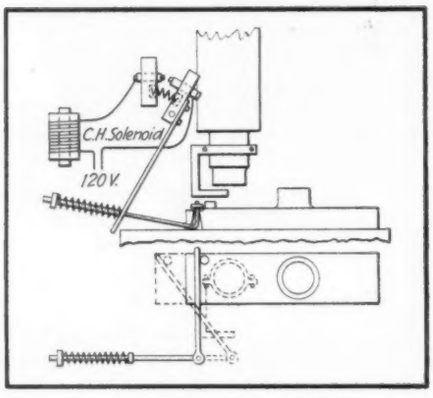
Safety, ease of fuse renewal, positive operation, and a strong, adjustable, and inexpensive mounting are features of this new cutout. Let us tell you more about its many radical design improvements. Ask your G-E representative for further information, or send for Bulletin GEA-1993, which gives complete descriptive and operating data. General Electric, Dept. 6C-201, Schenectady, N. Y.

The new 2-in-1 cutout supplements, rather than supersedes, the popular and accepted G-E porcelain-enclosed cutout shown at right.

GENERAL ELECTRIC 340-10

Faster, Safer Work by Electric Control

Faster production and safer operation result from the application of electric control to a No. 0 Niagara power press for light metal stamping in a Middle Western manufacturing plant. The press is of the familiar pedal trip type with the pedal now replaced by a solenoid which is energized as the bottom die is pushed into place to operate the press. Application of electric control to this particular press reconciles the two after conflicting considerations of production speed and safety and increases both.



Simple electric controls speed up metal presses

As the lower die is pushed back into place after loading the small stud on the end of the die carriage moves the horizontal lever, shown more clearly in the plan view, closing the contacts. The point on which the horizontal lever turns is not tight, but is free enough so that the projecting arm attached to the press ram depresses one side of the lever and thus lifts the other over the stud on the die carriage. Because of the springs between the contact members and on the long rod below, the lever system moves back to its original position and the solenoid circuit opens. The solenoid armature functions in place of the former foot pedal to set the press in operation.

The bottom die of the press is mounted on a slide which is pulled forward for insertion of the metal blank to be stamped. As the loaded die is pushed back into place it works a simple lever and spring system that closes the solenoid circuit. The solenoid armature trips the press and as the ram carrying the top die completes its downward movement it trips the lever and spring system, opening the solenoid. The lever system returns to its original position ready for action again after the bottom die has been pulled forward, the finished stamping removed and a new blank inserted.

The same idea, somewhat differently worked out, has been applied to another press in the same plant. This press cuts and shapes a length of copper tubing into form for assembly into one of the plant products. The press automatically discharges the finished piece by a blast of compressed air and all the operator has to do is to feed the tubing into the machine. The two methods of control are shown in principle in the accompanying diagrams.

So that the contacts will stand the gaff the long type distributor points from a model A Ford car are used. They are mounted, as shown in the sketches, in small fiber blocks and are arranged so that the separation between contacts may be adjusted according to the requirements of the machine controlled.

•

Control Combination Improves Operation

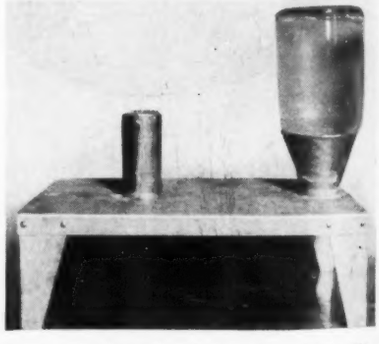
Utilizing recent developments in electrical control equipment to simplify installation, reduce maintenance and at the same time provide adequate protection to electric motors the Continental Can Company of Oakland, Calif., is using a new combination of standard equipment. Instead of the conventional cabinet-closed combination of fuse-disconnecting switch and magnetic starter, a three-pole deïonizing-type circuit breaker is mounted in the cabinet with a magnetic starting switch. The motor used with this combination is equipped with thermal overload protection built into the windings, the operating coil of the magnetic starter being wired in series with the overload protection element of the motor, thus eliminating the thermal units usually placed in the magnetic switch.

Short-circuit protection is provided by the circuit breaker, which also acts as a disconnecting switch, and overload protection is provided at the motor itself. Fuse replacement is eliminated by the use of the circuit breaker and the fact that the thermal element in the motor does not reset itself until proper operating temperatures have been reached prevents restarting the motor until safe operating conditions have been established.

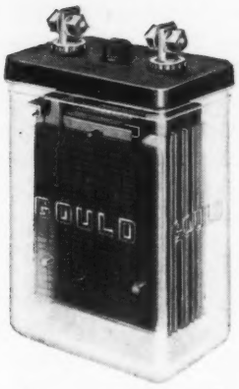
•

Electric Sterilizer Serves Dairies

To speed up the sterilization of dairy utensils the rural development division of the Edison Electric Illuminating Company of Boston, headed by N. D. Herrick, has developed a 1,000-watt outfit designed to generate steam in three minutes after closing the 115-volt supply circuit terminating in a heating element located in a 2½x6-in. cylinder shown at the left of the portable water table illustrated. The proper water level is maintained in the cylinder by the glass container of water shown at the right, and the table is equipped with a hot water discharge outlet at the left (not visible in the view) to enable the dairyman to draw off water as desired when doing other work. An ordinary milk pail can be sterilized in three minutes and a 10-gal. jug in seven minutes. In some Massachusetts dairies a premium is obtained on milk running



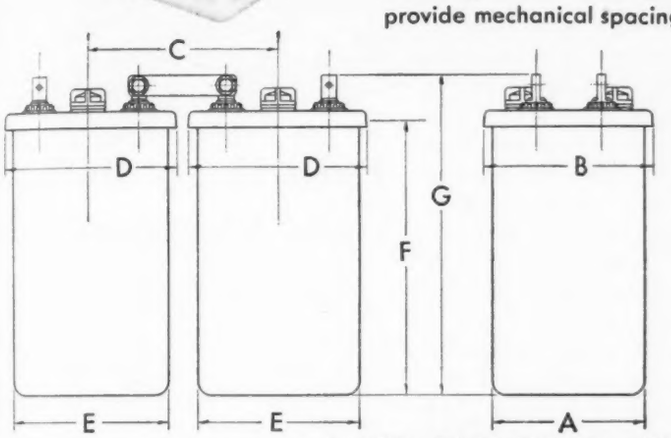
Steam generator heated electrically speeds up milk sterilization



GOULD

DREADNAUGHT STATIONARY CELLS

● GOULD Dreadnaught Cells are the paste plate type. Hand-pasted plates assure thorough compacting of active material in heavy staggered bar grids. Each positive plate is enclosed with a perforated hard rubber envelope, with solid sections surrounding the vertical edges of the plate. Separators of treated grooved white cedar provide mechanical spacing and adequate insulation. All Dreadnaught cells, except the HSC types, have the exclusive "Gould Dual Suspension Construction."



● This special Gould construction consists of projections (cast integral with the posts) which rest on the opposite top edges of the glass jar to support practically the entire weight of the element. The second means of suspension of each group structure consists of hard rubber channel supporting members. The Gould Dual Suspension eliminates cover distortion and the use of tie rods, at the bottom of the element.

● When initial economy is of paramount importance, Gould Dreadnaught Batteries should be specified.

RATED CAPACITIES AND TECHNICAL DATA

TYPE	CAT. NO.	A. H. CAP. 8 HR. RATE	DISCHARGE RATE IN AMPERES AT 77° F.					APPROX. NET WEIGHT	DIMENSIONS IN INCHES		
			FOR 8 HRS. TO 1.75 V.	FOR 3 HRS. TO 1.75 V.	FOR 1½ HRS. TO 1.75 V.	FOR 1 MINUTE TO 1.75 V.	FOR 1 MINUTE TO 1.50 V.		A	B	C
HSC-3	17471	20	2.5	5	8	37.5	70	21	4⅛	5	5¾
HSC-5	17472	40	5	10	16	75	140	23.5	4⅛	5	5¾
HSC 7	17473	60	7.5	15	24	112.5	210	26	4⅛	5	5¾
HSC-9	17474	80	10	20	32	150	280	31	5	5⅞	6⅞
HSC-11	17475	100	12.5	25	40	187.5	350	36	6	6⅞	7⅞
HSC-13	17476	120	15	30	48	225	420	38.5	6	6⅞	7⅞
NHSC-5	17479	80	10	20	32	140	260	45	4¼	5⅛	5¾
NHSC-7	17480	120	15	30	48	190	355	50	4¼	5⅛	5¾
NHSC-9	17481	160	20	40	64	240	450	60	5⅛	6	6⅞
NHSC-11	17482	200	25	50	80	285	540	70	6	6⅞	7⅞
NHSC-13	17483	240	30	60	96	325	625	75	6	6⅞	7⅞
NHSC-15	19795	280	35	70	112	425	800	105	8¾	9¾	10⅞
NHSC-17	19796	320	40	80	128	465	875	110	8¾	9¾	10⅞
NHSC-19	19797	360	45	90	144	500	950	115	8¾	9¾	10⅞
NHSC-21	21190	400	50	100	160	535	1025	145	12⅛	13¼	10⅞
NHSC-23	21191	440	55	110	176	570	1100	150	12⅛	13¼	10⅞
NHSC-25	21192	480	60	120	192	605	1175	155	12⅛	13¼	10⅞
NHSC-27	21193	520	65	130	208	640	1250	160	12⅛	13¼	10⅞
OSC-17	21278	608	76	152	242	900	1700	200	9⅛	10¼	15
OSC-19	21279	684	85.5	171	272	980	1860	210	9⅛	10¼	15
OSC-21	21280	760	95	190	302	1060	2020	220	11¼	12⅜	15
OSC-23	21281	836	104.5	209	332	1140	2180	230	11¼	12⅜	15
OSC-25	21282	912	114	228	362	1220	2340	265	13¾	14⅞	15
OSC-27	21283	988	123.5	247	392	1300	2500	275	13¾	14⅞	15

HSC-3 TO 13 AND NHSC-5 TO 13 ASSEMBLED END TO END. NHSC-15 TO 27 AND OSC-17 TO 27 ASSEMBLED SIDE TO SIDE.

HSC-3 TO 13 = DIMENSION D 8⅛"—E 7¼"—F 10"—G 12½".

NHSC-5 TO 13 = DIMENSION D 10⅛"—E 9¼"—F 13½"—G 15⅞".

NHSC-15 TO 27 = DIMENSION D 10¼"—E 9¼"—F 15¾"—G 18½".

OSC-17 TO 27 = DIMENSION D 14" —E 12⅞"—F 18" —G 20⅞".

SPECIFIC GRAVITY OF ELECTROLYTE . . . FULLY CHARGED 1.225 AT 77° F. (25° C.)

INTER-CELL CONNECTORS 1/16" THICK LEAD-PLATED COPPER BARS. TERMINAL CONNECTORS – LEAD PLATED COPPER LUGS.

ALL CELLS SHIPPED COMPLETELY ASSEMBLED, SEALED AND CHARGED, WITH NECESSARY INTER-CELL CONNECTORS AND ACCESSORIES INCLUDING 1 THERMOMETER AND 1 HYDROMETER WITH EACH COMPLETE BATTERY.

GOULD STORAGE BATTERY CORPORATION OF DEPEW, NEW YORK

below stated bacterial counts; thus, in the case of sterilizing 300 lb. per day below the 10,000-bacteria level per cubic centimeter the premium would be 75 cents.

•

Gold Mines to Be Air Conditioned

Air cooling of mines represents a huge load, as indicated by data from the Robinson Deep Mine in the South African gold fields. Equivalent in result to 2,000 tons of ice per day, this impending installation, according to the *Engineer* (London, August 10, 1934), in effect shortens the mine shaft by 1,500 ft. and adds 7½ years of life to the mine. The Turf shaft is down 8,500 ft., the deepest in the world, and to relieve the temperature conditions for the workers the plant will cool some 15,000 tons of air per day and circulate it at the rate of 400,000 cu.ft. per minute.

Several of the Rand gold mines are approaching the critical stage at which circulation of air that has not been artificially cooled does not avert the risk of heatstroke. It has been found that moisture-saturated air at 90 deg. F. induces almost immediate fatigue, which greatly reduces the profitableness of the mine operations.

•

Electric Heat Used for Ore Drying

That strip heaters are load builders of wide diversity is demonstrated by a recent application of electric heat for drying concentrate before the ore is treated in a furnace. For the average ore-drying pan 4 ft. wide, 8 ft. long and 13 in. deep 20 kw. of heat applied for an eight-hour period is necessary to dry thoroughly the ore for treatment.

The requisite number of strip heaters are applied to the bottom of the pan, covered with a sheet of asbestos to improve heating efficiency, and backed with a protective metal covering to prevent damage. Several such installations have been made in California mines, replacing less convenient and less efficient methods of heat application for this purpose. From the utility standpoint, the high consumption, load factor and power factor of these installations makes the application a particularly desirable form of new business development.

Electric Heat Proves in Greenhouse

Greenhouses using cordwood-fired, hot-water heating systems report heating costs ranging between 4 and 5 cents per square foot of area per season. Such costs include labor of handling the wood, but do not include maintenance and fixed charges of the heating equipment. As the size of the greenhouse increases above 2,500 sq.ft., the cost of heating by ordinary fuel-fired systems will decrease in comparison with the cost of equivalent electric heat at 7.5 mills per kilowatt-hour. Perhaps best results from the standpoint of plant propagation and economy of heating would be gained in the case of large greenhouse operations, by heating all growing benches and ground plots with electric cable buried in the soil and to operate the fuel-fired heating system in the coldest weather when radiation from the electrically heated beds would not maintain sufficiently high air temperatures. Such fuel-fired heating systems could be of the inexpensive hot-air type with fans to circulate the heated air.

Accurate heating cost records have been obtained by A. H. Greisser,* Portland General Electric Company, Portland, Ore., from typical greenhouse operations in Portland. One greenhouse with 4,500 sq.ft. of glass area used 2,500 gal. of Diesel oil at 5 cents per gallon and $30 in electrical energy in operating an oil burner and oil heater, to maintain a greenhouse temperature averaging 55 deg. F. in the October 1 to April 15 season. The heating system is hot water with automatic temperature control. The total operating cost was 3.44 cents per square foot of glass area per season, and it is estimated that 15 kw.-hr. per square foot per season with electric heating cable would have maintained a proper temperature for the crops grown in this operation.

*Excerpted from paper at Portland meeting of engineering and operating division of Northwest Electric Light and Power Association.

•

Paris Heats Outdoor Cafés Electrically

Several sidewalk cafés in Paris are using portable electric unit blower heaters like those shown to make their patrons comfortable in winter. They discharge the heated air in all directions, generally below the level of the knees, and never above the shoulders. Consequently, objectionable drafts are avoided, the cold air around one's legs and ankles is displaced and sufficient hot air envelops the patrons so they are comfortable even if they can't take off their coats.

How about using this method to remove the chill in homes during early spring and late fall, when it is relatively expensive to operate central coal-burning systems?

Blower-heater makes outdoor table service comfortable in winter

NEWS HEADINGS AFFECTING
RATES . . . (A SERIES)

Trial-Use Plan Increases Range and Water Heater Saturation

● Free electricity—range rentals—lower cost ranges—lower installation charges—no down payments . . . . truly the manifestations in selling load are many and varied.

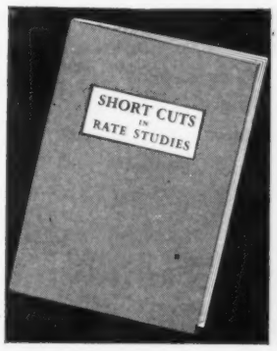
The important element, however, in order to achieve success in any or all plans must be a thorough and accurate rate study which includes a complete analysis of monthly bills and total annual consumption.

Many times a short-cut analysis of consumption leads to inaccurate conclusions which, to put it mildly, is courting severe losses.

With Recording and Statistical Corporation's proved procedure available for making a Bill and Customer analysis of the full year consumption—there is no necessity today for risking makeshift analyses.

The work is done by highly-skilled specialists employing the most modern equipment. Long experience in serving utilities enables the R & S staff to introduce many worthwhile economies in getting the results you need in the shortest possible time.

May we send you a complimentary copy of an interesting booklet, "Short Cuts in Rate Studies"?



The result of many years' experience in compiling Bill and Customer Analyses for leading public utilities.

Recording & Statistical Corporation

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102 MAIDEN LANE NEW YORK

BOSTON — PHILADELPHIA — CHICAGO — DETROIT — MONTREAL — TORONTO

Mercury-Vapor Lamps, 29 Lumens per Watt

Increased efficiency and notable gains in quality of output have been realized in a pioneer mercury-vapor street lighting installation at Lynn, Mass., placed in service on September 27 by the Lynn Gas & Electric Company in conjunction with the General Electric Company and the city author-

Combination mercury vapor-incandescent lamp with luminaire removed as installed at Lynn

ities. The new units represent a combination of a 400-watt mercury-vapor lamp producing 14,000 lumens and a 200-watt incandescent lamp delivering 3,400 lumens. Eight units are in service at this writing in the immediate vicinity of the new post office in the Shoe City. There is a clear gain of about 50 per cent in efficiency in the combined unit compared with the multiple incandescent lamps already giving excellent lighting.

The heart of the new unit is a high-intensity mercury-vapor lamp inclosed in a glass tube 2 in. in diameter x 13½ in. long and having a mogul base. The lamp is vertically mounted, base down. Within the outer bulb is a sealed bulb about 7 in. long x 1⅜ in. in diameter within which the arc occurs. When the current is turned on the mercury lamp glows with a relatively weak and greenish blue light, operating at 20 amp. and 5 volts. As the heat continues the pressure rises in the inner bulb; the light output becomes more intense and whitish in appearance, and stable operation is reached at 155 volts and 2.9 amp. The light is now concentrated into a brilliant pencil-like beam extending the length of the inner tube.

In the outer tube about half an atmosphere of nitrogen prevents loss of gas in the inner bulb. It is necessary to operate the lamp vertically because of the high core temperature, about 6,000 deg. C. The incandescent lamp provided with a reflector in the upper part of the unit not only corrects the color value to provide effects approximating daylight, but it also supplies heat for starting the mercury lamp in cold weather. It also insures continuous service in the event of outage on the part of the mercury lamp, since if the energy supply is temporarily cut off or a decided voltage drop occurs the mercury-vapor unit has a tendency not to restart until it has cooled. The incandescent lamp is mounted base upward in the unit and its reflector has a sharp cut-off at 75 deg. from the horizontal. The power factor of the unit on a multiple circuit is about 60 per cent uncorrected, but with proper transformer and condenser facilities this can be raised to exceed 90 per cent. A minimum life of 1,500 hours is guaranteed at present. Laboratory developments have realized an efficiency of 80 lumens per watt for mercury-vapor unit alone.

•

Radio Frequency Heat Treats Tools

In the use of radio frequency in the heat treating of small tools current from an oscillator is made to pass through a coil about the size of an ordinary coffee cup. The tools to be treated are placed inside of this coil and their impedance to the flow of the radio-frequency current through the coil causes them to become heated to the temperature required.

One small model weighing not more than 75 lb. was manufactured at the Radio Division of the Westinghouse company in Chicopee Falls, Mass., and has been successfully used in treating lathe tools, drills, etc.

Tubes used in the oscillator are of the same type as those used in ordinary broadcasting transmitters. The frequency of the induction furnace is 375 kilocycles, a frequency which approaches the lower end of the radio broadcast band. The output of the oscillator delivered to the coil for heat treating is approximately 100 watts. Two tubes are used in a circuit which provides self-rectification of the 60-cycle input power and the total input is not in excess of 400 watts.

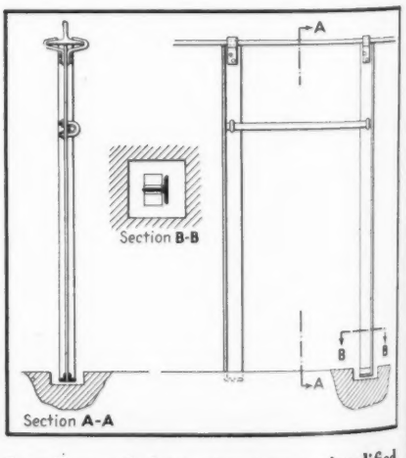
•

Avoiding Effects of Uneven Floors

By RICHARD BANZ
Chicago, Ill.

Installation of shop-assembled bus and other apparatus structures in substations frequently includes the exact dimensioning of vertical supporting members on the job.

Slightly uneven concrete floors in

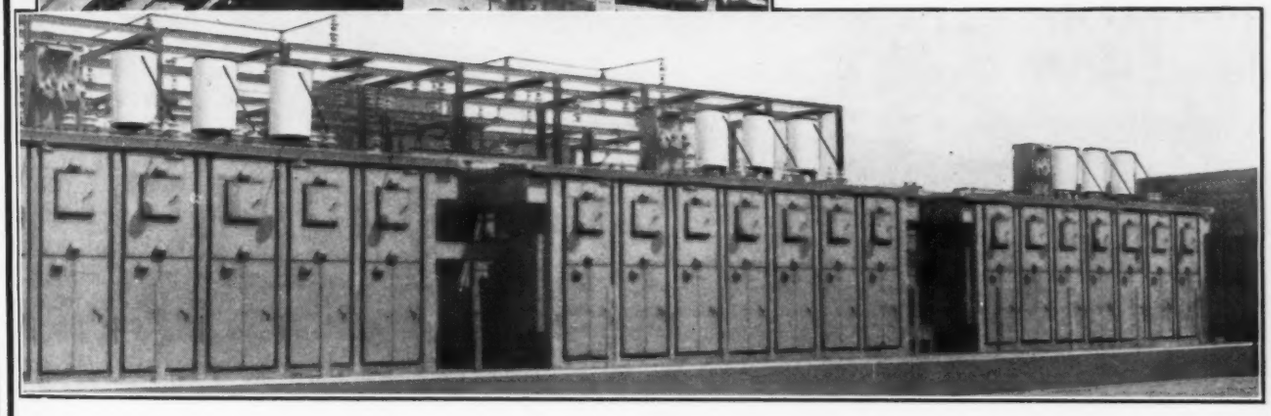


Leveling of bus structures simplified

substations sometimes hamper the installation of shop-assembled bus structures. This problem no longer arises in the substations of the Public Service Company of Northern Illi-

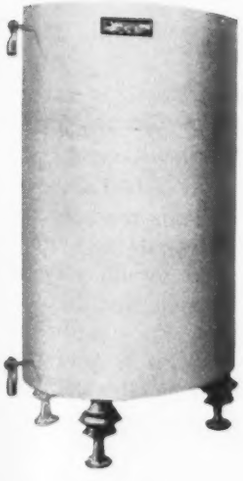
IN CHICAGO

AS IN MANY OTHER METROPOLITAN AREAS



MURRAY LOW LOSS REACTORS

PROTECT PRIMARY DISTRIBUTION SYSTEMS



Maximum Short Circuit Protection

Maximum Reactor Efficiencies

Minimum Energy Losses

Minimum Space Requirements

●

INFORMATION ON REQUEST

Some Murray Low Loss Reactor Users

United Electric Lt. & Pr. Co.
New York Pr. & Lt. Co.
Dayton Pr. & Lt. Co.
Houston Pr. & Ltg. Co.
New York Edison Co.
Southern Wisconsin Pr. Co.
New Orleans Pub. Ser. Co.
Union Elec. Lt. & Pr. Co.
Southern Calif. Edison Co.
Northwestern Elec. Co.

METROPOLITAN DEVICE CORP.

1250 Atlantic Avenue, Brooklyn, N. Y.

nois. It was very simply, and finally, solved. When plans for new substations are drawn provisions are made for the erection of the bus frame by marking its exact location on the floor plan and providing an 8-in. square opening wherever the supporting steel of the frame will rest. The length of this steel is then fixed by taking a mean distance from the I-beam on the ceiling into the opening on the floor. During installation the bus structure, instead of resting on the floor, hangs from the ceiling and is set firm by simply filling the floor opening with cement. As no field adjustments are necessary all the drilling and cutting can be done in the shop and the time usually required for installation is considerably shortened.

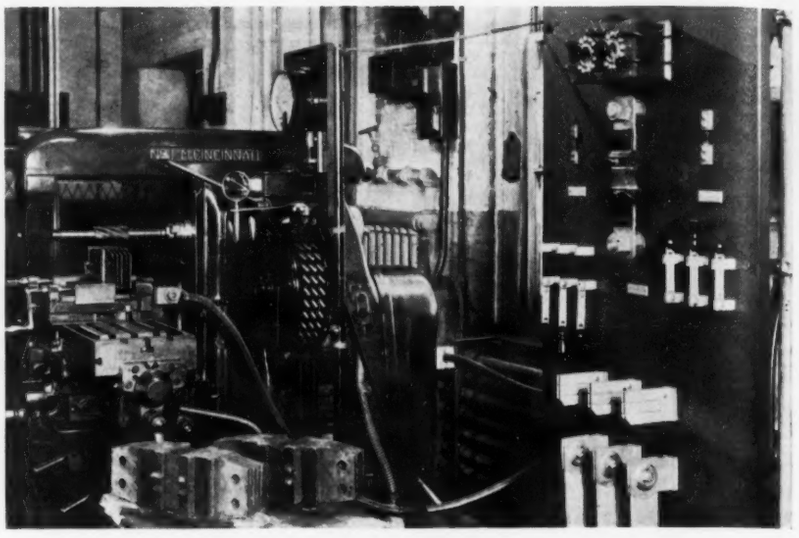


Fig. 1—Shunts are milled to accuracy while in calibrating circuit.
On the panel at the miller are the ammeter for approximate setting of the current value, the control rheostat and galvanometer with reading glass. On the power panel are the heavy current switches, standard shunts and bridge-arm resistors.

•

Shunts Milled During Calibration

By PAUL MacGAHAN
Meter Engineer
Westinghouse Electric & Manufacturing Company, Newark, N. J.

Particular shunts adjusted only for use with particular millivoltmeters are no longer the practice. Shunts now are built interchangeably to a 50-mv. (in some cases 60-mv.) standard. Hand filing of these shunts to the proper cross-section has been superseded at the Westinghouse meter works by the use of a milling machine located close to the test panel which mounts the group of standardized shunts (Fig. 1). The shunt under calibration is placed on the milling machine table while connected in the Kelvin bridge circuit in which comparison is made with the standard shunts. When the galvanometer (Fig. 2a) shows that the resistance has been brought to the requisite value by taking off metal from the edges of the laminations the milling machine operation is stopped. The shunts are built to an initial value of about 45 mv. drop to leave margin for increase to the 50-mv. value as the cross-section is reduced.

The Kelvin bridge method has superseded the millivoltmeter method of comparison, because the latter was found susceptible to stray field and temperature errors. A high-resistance millivoltmeter calibrated in amperes is still used, but merely as a rough guide in setting the current to an approximate value corresponding to the capacity of the shunts. A heavy capacity unipolar generator is used to furnish the low-voltage supply.

To avoid the necessity of using a large number of standard shunts corresponding to all ranges of shunts to be tested variable tap resistances are used (Fig. 3). This permits the use of but four shunts rated at 10, 100, 1,000 and 10,000 amp. All capacities between 4 amp. minimum and 40,000 amp. maximum may thus be calibrated by reference to the following table:

Position of Rheostats	Resistance in Ohms of Each Step	Capacity of Test Shunt Using Standard Shunt			
		10 Amp.	100 Amp.	1,000 Amp.	10,000 Amp.
A-A	12.50	40	400	4,000	40,000
B-B	14.28	35	350	3,500	35,000
C-C	16.66	30	300	3,000	30,000
D-D	20.00	25	250	2,500	25,000
E-E	25.00	20	200	2,000	20,000
F-F	33.33	15	150	1,500	15,000
G-G	41.66	12	120	1,200	12,000
H-H	50.00	10	100	1,000	10,000
I-I	62.50	8	80	800	8,000
J-J	66.66	7.5	75	750	7,500
K-K	83.33	6	60	600	6,000
L-L	100.00	5	50	500	5,000
M-M	125.00	4	40	400	4,000

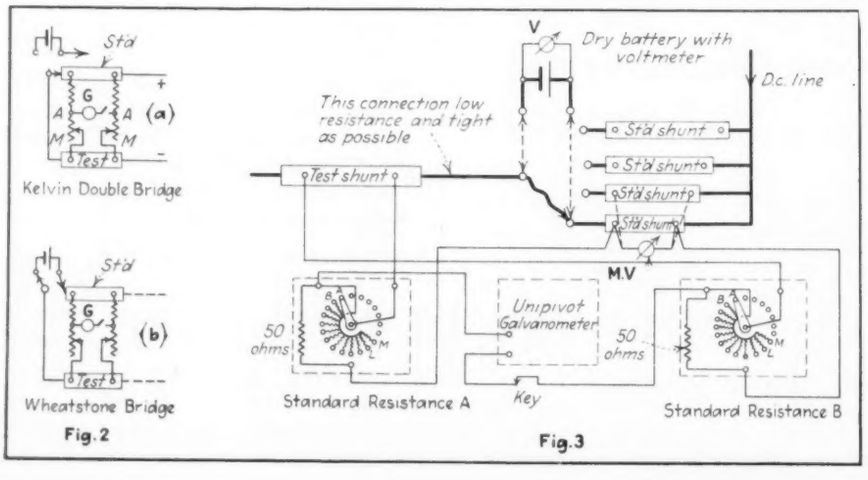
The accuracy of this method is of the order of $\frac{1}{10}$ of 1 per cent for shunts up to 10,000 amp. For higher capacity shunts the accuracy becomes somewhat less, owing to generator limitations and to difficulty in securing perfect current distribution in heavy terminals. For capacities beyond 10,000 amp. it is preferable to use two or more smaller shunts in parallel with individual millivoltmeter leads to the studs of the common millivoltmeter. No error results from unequal distribution between the paralleled shunts in this arrangement.

Fig. 2 (left)—Kelvin double bridge used in calibration

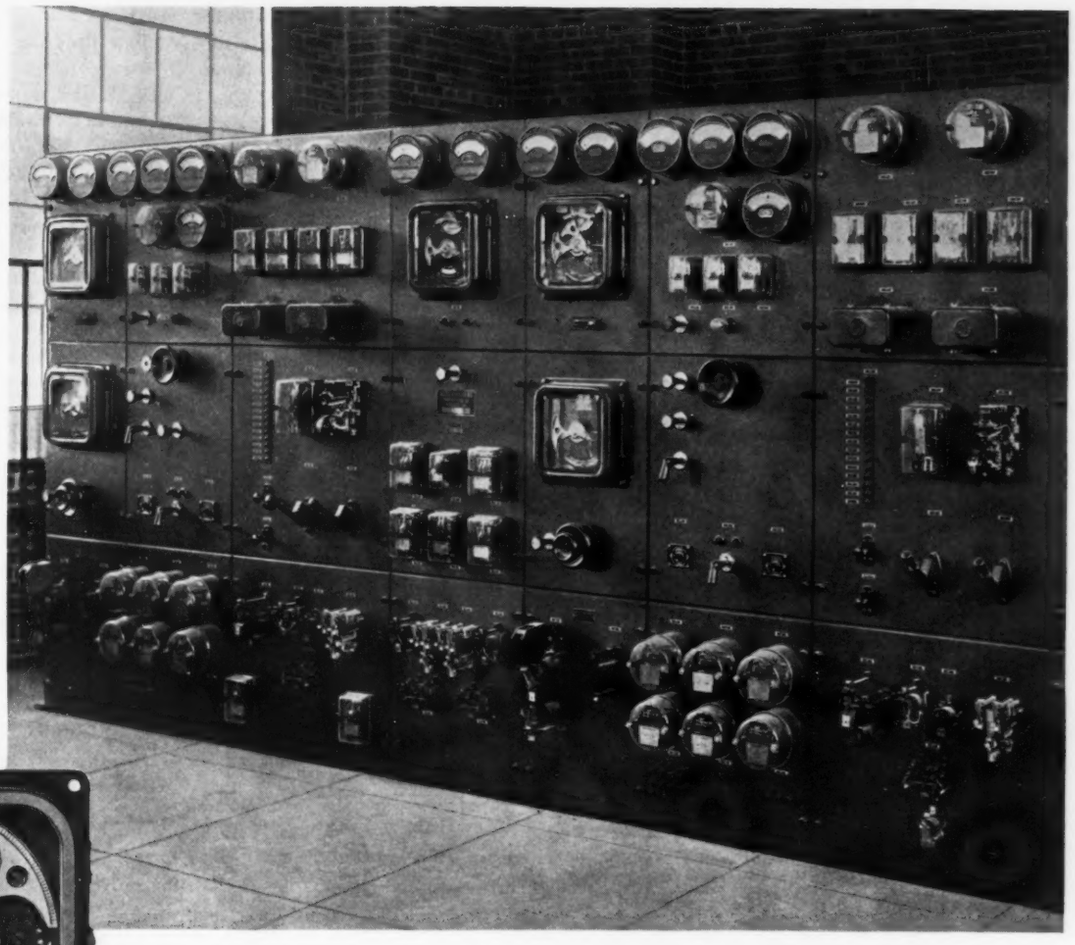
Circuit of (a) is switched occasionally to the Wheatstone arrangement of (b) to compare the resistances of Fig. 3. In (b) the shunts are relatively so low in resistance as merely to constitute corners of the Wheatstone bridge.

Fig. 3 (right)—Double bridge employs graduated resistances

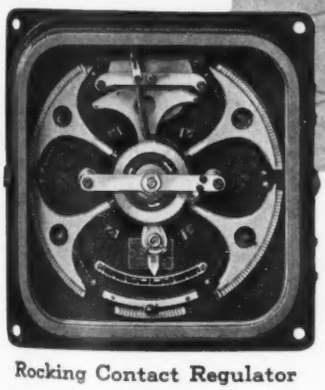
Steps (see table) range from 12.5 to 125 ohms for 40,000 to 4 amp. of extreme range.



Constant Voltage with variable Loads



Allis-Chalmers Switchboard with Rocking Contact Regulators installed in an automatic hydro-electric station.



Rocking Contact Regulator

Allis-Chalmers Rocking Contact Type Voltage Regulators (Brown Boveri Design) operate similarly to, and require no more maintenance than voltmeters, yet they give automatic, dependable regulation, offsetting the effects of fluctuating power loads.

Allis-Chalmers Regulators are quick acting. The rocking contacts give full dependability and there is practically no wear. They need little supervision, cleaning or attendance. Performance records of more than 26,000 Rocking Contact Type Regulators in all parts of the world are the reason for their growing popularity. Write to Allis-Chalmers Mfg. Co., Milwaukee, for a descriptive leaflet.

ALLIS-CHALMERS

Basis for Interchange Practice

[*Continued from page 29*]

fuel rate curves vary among different machines, so that if a turbine is loaded on the primary valve and has an increment greater than another available unit the dispatcher reduces the load on the primary valve and transfers it to the primary valve of a more efficient machine. In other words, the practice is not necessarily to load up a machine with the entire required output unless it is the most efficient unit. There are cases where operating on the secondary valve of a machine gives more economical results than running on the primary valve of an older one. When the company's machines are operating at the most efficient loading feasible the company will then offer for sale the blocks of power remaining inside the turbo-generator ratings before putting in another unit. In some cases the price for the first kilowatt-hour on an additional machine may run up as high as $9, but it decreases with output.

"Is anything else except the upkeep of structures ever subtracted from the maintenance cost per kilowatt-hour," was another question raised. In some cases the upkeep of turbo-generators and electrical apparatus is taken out. Many times in selling interchange power to New England Power the current in the machine does not change due to the fact that New England may be carrying the wattless component. As the maintenance of a generator is proportional to the current carried, it was claimed the company does not add in generator repairs where there has been no change in the current carried. The only thing asked by the Edison company in selling such power is whether New England Power wishes the full load it is operating protected. If the answer is affirmative, it may be necessary to put in another machine. Usually New England will protect its own load under such conditions, because of the cost of bringing another unit into service in the Edison plants to take over that part of the interchange supply which a machine may be delivering just before it fails.

In figuring line losses nothing is added for transformer core losses, but the resistance loss in transformers and lines resulting from the increased load is computed and added.

The use of the yearly average cost of coal is not desirable in computing fuel increments because of the variations in the economy of different machines and desirability of monthly coal-cost computations. It would be possible to arrive at a definite price for interchange power, applicable over six months or a year, if the purchaser could specify exactly when the interchange would be wanted (time of day) and the amounts needed at such times.

Handling cross-system transfers

The essential features of the intercompany agreement for transferring energy by Edison on behalf of New England Power to the Eastern Massachusetts system at Malden and Revere were outlined in the August 18 issue. Mr. Dillon was asked to explain this agreement from the operating standpoint. He pointed out that the practice is simply to absorb energy from New England at the receiving point (measuring the input at Millbury, the power company's load-dispatching headquarters and most central substation), and then as closely as possible to deliver an equivalent amount of energy at Malden and/or Revere. Whether any such energy transfer is made or not depends on the existence of surplus transmission capacity on the Edison system. Edison receives a profit of 1.3 mills per kilowatt-hour for such cross-system transfer service.

Usually this equivalent transfer takes place at a time when New England is selling energy to Edison at interchange rates, perhaps at around 2 mills per kilowatt-hour. Such energy from New England Power would be utilized in areas convenient to the Millbury-Edgar line, taking off blocks for other points, and sending the equivalent from L Street to Malden.

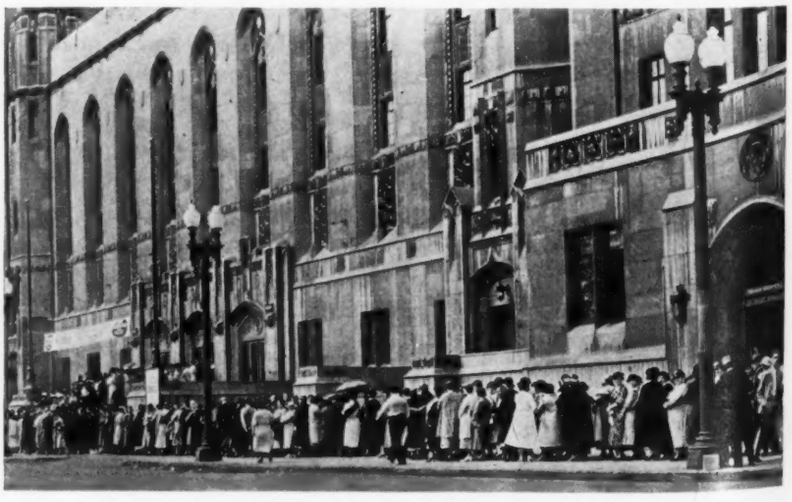
Interesting Women in Modern Kitchencraft

Nearly 10,000 Detroit housewives attended two afternoon performances of the Norge "Modern Kitchencraft" show at the Masonic Temple, Detroit, recently. Primarily it was staged to ascertain the preferences of women as to various refrigerator cabinet finishes, rather than interview them on their doorsteps. Previews of actual models allowed a ballot of preferences. Sixteen colored models were displayed, but outstanding favor went to standard white.

The program included entertainment, lectures, dramatizations, singing, vaudeville, ballet dancing and orchestra, presented in a two-hour show. It is estimated that 40,000 housewives have heard of this performance and Detroit Norge sales are reported to have doubled since the show. The playlet—a comedy—brought in the "Rollator" refrigerator. Ballet dancers performed on the top of refrigerator cabinets to demonstrate their ruggedness. Both President Howard E. Blood and Sales Manager John H. Knapp addressed the audience. Household editors of all Detroit newspapers appeared.

The show was promoted by newspaper advertising, radio spot announcements and store promotion by Norge dealers and Kroger chain stores. In the latter Norge refrigerators were displayed, manned by special salesmen, who reported many prospects and sales. Programs were placed in food deliveries and Kroger supplied baskets of groceries as prizes.

J. L. Hudson Company, a leading Detroit department store, tied in with a two-day promotion directly following the show, in which colored models were displayed and the playlet enacted twice a day. The director of its home-service department reports an attendance of 2,700 women, and the merchandising manager reports greater sales and store traffic than ever before.



Crowds lining up for "Modern Kitchencraft" show

Stocks for Immediate Delivery

Through Graybar's 74 Warehouses

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STANDARD
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A strong and efficient hardware bronze connector. The reversible nut, pilot to help thread the nut, rounded slot edges and precision cut threads make this connector an outstanding product.

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GraybaR QUALITY Since 1869 — Distributed and guaranteed by GraybaR ELECTRIC COMPANY

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POLE LINE CONSTRUCTION TOOLS

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Diggers	Pole Supports
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Manufactured By
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HAS MANY OUTSTANDING FEATURES WHICH MAKE IT DESIRABLE WHERE ACCURACY AND DEPENDABILITY ARE REQUIRED

Equipped with Waltham movement, synchronous motor and mercury switch to guard against corrosion, pitting, or open arcing.

Different types available for various applications. Write for Bulletin No. 115.

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Double Tube Sleeve

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- Split Tinned Copper Underground Connectors
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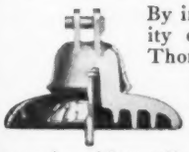
Underground Cable Connector

The National Telephone Supply Co.
Cleveland, Ohio

If it's a Splice make it a National

THOMAS INSULATORS



By insuring a continuity of power service, Thomas Insulators remain unchallenged for Reliability. They perform faithfully for years by withstanding the supreme tests of line service under all conditions.

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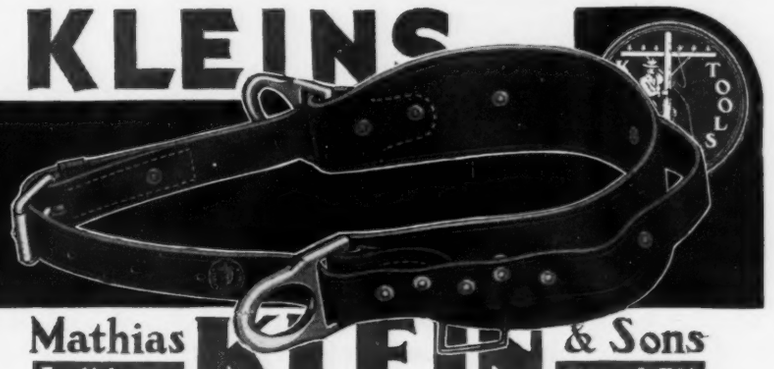

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Controls for Production

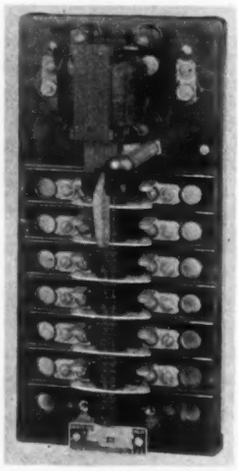
[*Continued from page 28*]

pump drives a pair of pusher rods upward, and these, acting on the spring levers, release the brake in a manner similar to that accomplished by the solenoid. Continued operation of the pump motor holds these rods in their up position, rendering the brake inoperative until the current is cut off, when the push rods fall and the spring once more sets the brake. These brakes are rated by the manufacturers on the basis of the pounds torque at one foot radius that they will sustain.

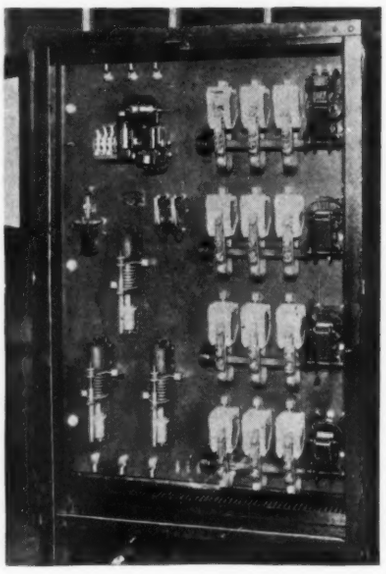
If the leads to a motor which is running in a given direction be reversed, the motor, in its attempt to run in the opposite direction, will first come to an abrupt stop. This principle of securing the immediate stopping of a motor is called "plugging" and is employed where there is no requirement for the motor to hold its load. Plugging is accomplished by the use of a controller by which the main lines to the motor are reversed when it is desired to stop the motor promptly. If, however, the controller alone were used the motor, having once reached its no-speed point, would immediately start to run in the reverse direction. This is prevented by a plugging, or slip, switch.

While the different types of these switches may vary somewhat in details of construction, the principle of all is practically the same. The pilot wires of the reversing section of the controller pass through this switch, which is closed while the motor is running in the forward direction by a revolving friction disk driven from the motor shaft. When the reverse section of the controller is actuated the motor immediately stops, but upon the first fraction of a revolution in reverse direction the friction disk causes the breaking of the pilot circuit and disconnects the reverse contactor, leaving the motor at a standstill. Modifications are made in cases where no reverse movement is permissible, the pilot contact being broken by the action of a counterweight or centrifugal regulator just before the motor can start on its reversed rotation. The plugging, or slip, switch may be connected to the shaft of the motor with which it is used by belt or silent chain and the switch mounted on the floor or, in many installations, it is connected directly to the end of the rotor shaft and its casing is attached to the frame of the motor.

(D) Co-ordinating Devices—In addition to the use of motors and their accessories as individual units it is often desirable to install a number of motors so that they will operate in co-ordination with each other and thus insure a sequence of operations



Multi-circuit relay for motors
General Electric



Control panel and work cycle timer
Monitor Controller

which would otherwise require the service of one or more attendants, and even then would be subject to human oversights. The simplest case of this type of sequence operation is that of a plant or a machine employing two or more motors for its drive. In starting this plant or machine each motor, to perform its proper function, must be started in its proper order and no motor, other than the first, should be started until that preceding it has been placed in operation. This is efficiently accomplished by the use of interlocks on the control. If the controller for motor No. 1 is provided with an interlock, which is simply a contactor through which the pilot circuit of controller No. 2 passes, it is clear that the second controller cannot be energized until the first controller with its interlock has been closed. Also, that any failure causing controller No. 1 to open will also open the control circuit of motor No. 2, so that motor No. 2 will also cease to operate. This arrangement may be extended to any number of motors, so that the only way they can be started will be in the desired sequence.

At times two motors are used for the same purpose, one being held in reserve as a spare. In such cases, if the pilot circuits of their controllers are cross-connected and the interlocks of each arranged so that in closing it opens the pilot circuit of the other, it will then be impossible to operate either motor when the other is running.

The interlock on a controller may be used simply to complete the control circuit, so that the following motor may be started at will, or it may be used also to perform the function of a "start" push button so that the starting of the first motor will automatically start the next or any number of other motors in the series.

While controllers may be built with more than a single interlock it is simpler, if more than one circuit is to be handled, to have the interlock control a multi-circuit relay outside of the controller. Upon closing of the first controller and its interlock, the magnet coil of the relay is energized and, by raising a plunger, any number of pilot circuits which may be connected to the relay are made or broken, thus starting or stopping the various motors in the system as may be desired.

The demand for sequence operation is frequently such that it can be governed by predetermined time intervals and such requirements are readily achieved by the use of the work-cycle timer. This device is run by a constant-speed, electric motor and, by adjustment of the settings of the successive contactors with which it is equipped, it will actuate a motor for starting, accelerating, decelerating, plugging, reversing or any sequence of operations that may be desired. It may also be used for starting and stopping a number of motors in any required time cycle. The timer is, of course, an auxiliary device in that it

controls only the pilot circuits of the switches, controllers and other devices by which the various operations of the motor or motors are actually effected. It is often desirable, for convenience and compactness, to combine all of these on one panel. This gives a complete automatic control panel which may be mounted in a steel cabinet or, if conditions of installation make it desirable, they may be mounted on a switchboard panel, for incorporation with other panels in a switchboard.

Can combine standard units

Special control is really special only in so far as the combination of parts and their method of mounting is involved. The parts themselves are usually all, or nearly all, standard, so that while special control does necessarily involve some increased expense it should not inevitably be thought of as "special." Each problem should first be thoroughly investigated as to the possibility of securing the desired results by the use of standard equipment, but in many cases it will be found that special combinations will secure an increase in efficiency fully warranting their employment.

The "custom-built" controllers for governing the functions of several machines include provisions for automatically starting, running at high speed, changing to low speed, plug-brake stopping and overload protection. The employment of machine-timed operation, rather than manually timed, results in a high degree of accuracy and standard of finish as well as enabling a single operator to run three or four machines simultaneously without undue effort.

•

Reduction in Lamp Prices

With sales of Mazda photoflood lamps showing an increase of 100 per cent over last year, the Westinghouse Lamp Company has announced list price reductions of 10 and 55 cents respectively in the two lamps of this line. "Already this year we have sold more Photoflood lamps than in all of 1933 and twice as many as in 1932, which may be regarded as a good indication that the general public is learning to use this valuable photographic tool," said David S. Youngholm, vice-president and general manager of the Westinghouse Lamp Company. The small Mazda photoflood lamp is reduced from 35 to 25 cents and the large size from $2.55 to $2.

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CONTAINS SUGGESTIONS OF PROVED VALUE IN BUILDING ELECTRIC FURNACE LOAD

● This book is a comprehensive, practical treatise on the subject of building electric melting furnace revenue. It contains many suggestions, all of which have proved effective in actual utility experience.

Melting furnace load produces $6 to $10 revenue per ton of iron melted—$3 to $6 per ton of brass melted. Melting the metal for pouring two cast iron manhole covers represents as many kilowatt hours as the average year's operation of a flat iron.

We believe this booklet is the first presentation of recent utility developments in the melting field. We will send it to any utility man without cost—it contains practical and *new* suggestions.

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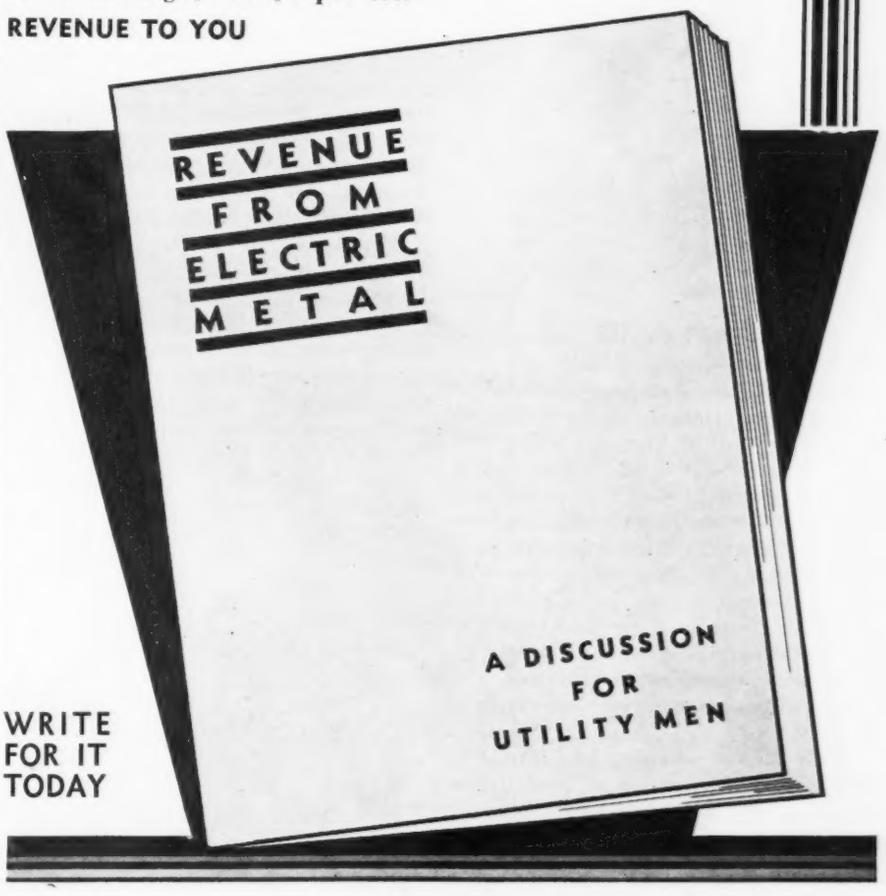

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MEN OF THE INDUSTRY

DellPlain Returns East as Welsbach Vice-President

Morse DellPlain, president of the Northern Indiana Public Service Company, Hammond, resigned October 15 to become vice-president of the Welsbach Street Light Company of America, with headquarters in Philadelphia. At the same time he announced his resignation as president of the Gary Heat, Light & Water Company, the Indiana Service Corporation and the Indiana Hydro-Electric Power Company. In his new position Mr. DellPlain will have charge of the electric department of the Welsbach company. Formerly associated with the United Gas Improvement Company of Philadelphia, Mr. DellPlain

Morse DellPlain

will return to the East after sixteen years in the utility business in Indiana.

Mr. DellPlain became vice-president and general manager of the Hammond properties in 1918 when the utility was known as the Northern Indiana Gas & Electric Company and was owned and operated by the United Gas Improvement Company. Control of the company passed into the hands of the Midland Utilities Company in 1923 and Mr. DellPlain, because of his past record as an operating executive, was retained by the Insull management. He was promoted to the presidency of the company in 1929.

Born in New Orleans, La., Mr. DellPlain spent most of his boyhood in the Republic of Mexico. Later he was identified with the Westinghouse Electric & Manufacturing Company for several years. Subsequently he joined the Syracuse Lighting Company, Syracuse, N. Y. In commenting on Mr. DellPlain's resignation John N. Shannahan, chairman of the company, said: "We very much regret the loss of the services of Mr. DellPlain, under whose leadership the companies he headed have enjoyed a splendid growth in the sixteen years he directed their operation. His fellow board members are happy with him over what we regard as an advancement and a recognition of his ability."

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F. C. Jones Made President of N.E.M.A.

Frank C. Jones, president of the Okonite Company and an outstanding figure in the wire and cable industry, was elected president of the National Electrical Manufacturers Association at the meeting held last week in Chicago. Mr. Jones became identified with the Okonite Company immediately following discharge from military service after the World War, when he entered the factory of the company at Passaic. With his election as treasurer he was transferred to the New York office, subsequently being elected to the executive position of vice-president and general manager. It was in the summer of 1932 that Mr. Jones assumed the duties of president of the Okonite Company, when H. Durant Cheever, who had occupied that office, became chairman of the board.

Mr. Jones has devoted considerable time to the activities of the National Electrical Manufacturers Association, concentrating particularly on its wire and cable work. He is chairman of the code advisory committee of N.E.M.A. and chairman of the supervisory agency for the wire and cable subdivision of the electrical manufacturing industry. He was formerly chairman of the wire and cable section and also of the paper cable group of N.E.M.A. Mr. Jones was educated at the Noble and Greenough School at Boston and at Harvard University.

•

► GEORGE SUTHERLAND, formerly assistant general superintendent New York & Queens Electric Light & Power Company, is now general superintendent.

► D. A. WOLFF has been appointed sales promotion manager of the Edwin L. Wiegand Company, Pittsburgh, Pa., to succeed W. Hunter Snead, who recently assumed the duties of promotional sales representative of the West Virginia Pulp & Paper Company with headquarters in New York (ELECTRICAL WORLD, September 29, page 95).

Stahl and Beardsley Assume New Operating Duties

C. R. Beardsley, formerly assistant to the superintendent of distribution of the Brooklyn Edison Company, has been appointed superintendent of distribution to succeed Abram Hussey, resigned. E. C.

E. C. M. Stahl

M. Stahl, formerly assistant operating superintendent, has been named operating superintendent to succeed Bert Houghton, resigned.

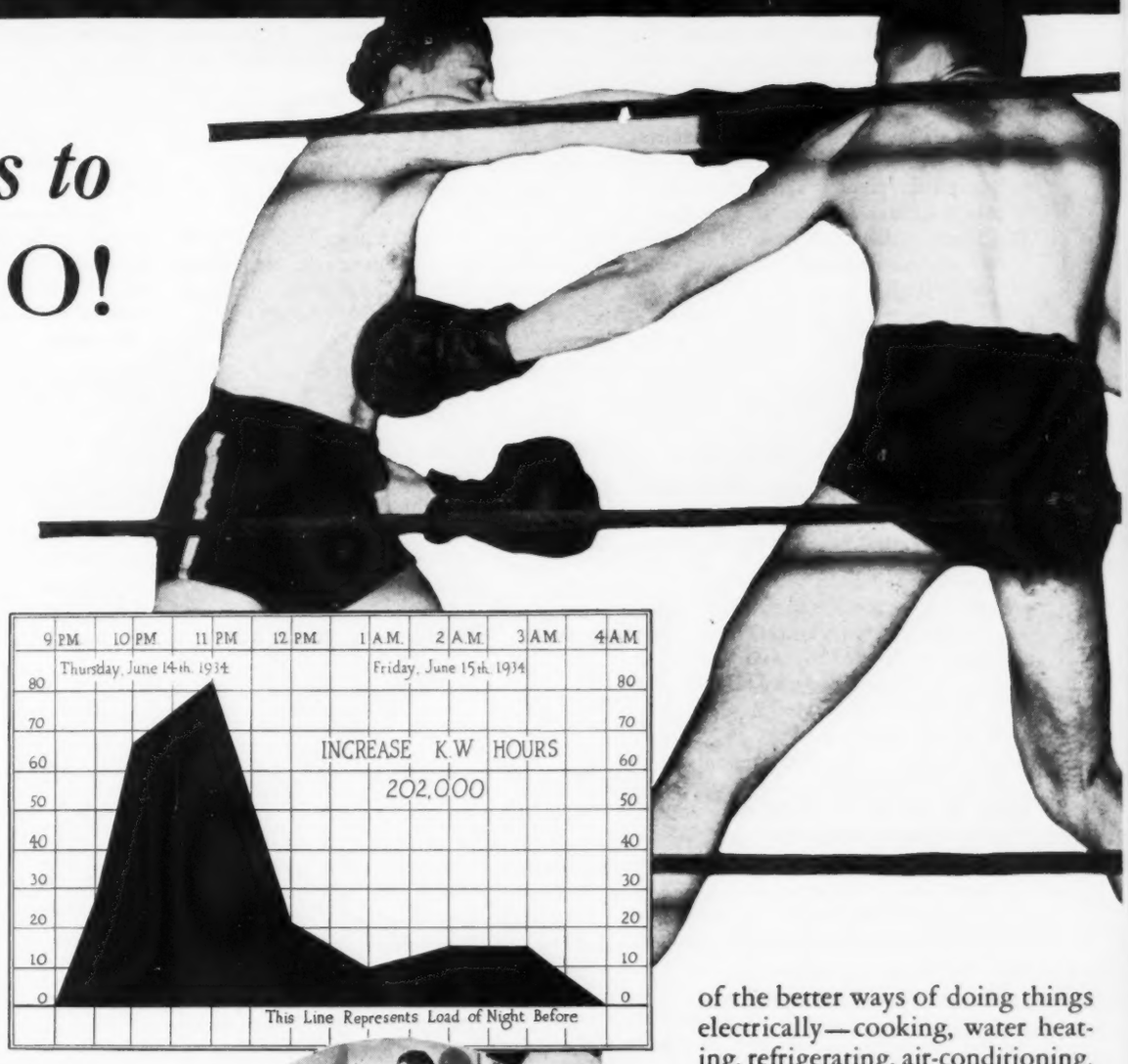
Mr. Beardsley had been assistant to the superintendent of distribution for two years, prior to which he held the position of electrical construction engineer, in which capacity he joined the Brooklyn Edison Company in 1923. After graduation from Sheffield Scientific School, Yale University, in 1905, he was em-

C. R. Beardsley

ployed successively by the General Electric Company, the United Illuminating Company, Bridgeport, Conn., and Fred T. Ley & Company of Springfield, Mass. He has been particularly active in safety work and is a member of the accident prevention committee of the Edison Electric Institute and of the safety codes

New York Edison Won too

..thanks to RADIO!



Baer was not the only winner in the last championship fight. Public utilities from Maine to California won, too. Just note the load increase of only *one* of these lighting companies, The New York Edison Company—about $10,000 in additional revenue! Cast that up in proper ratio to all central stations and the winning purse runs into many more thousands of dollars.

And yet radio is still doing only half a job for many utilities. Radio can and does do a selling job, as well as a load building job, by informing American housewives of the better ways of doing things electrically—cooking, water heating, refrigerating, air-conditioning. There are innumerable lighting, heating, ventilating and power stories that local NBC stations can place in your customers' and prospective customers' homes—programs prepared for you by NBC's program experts.

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correlating committee of the American Standards Association.

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Stanton Hertz

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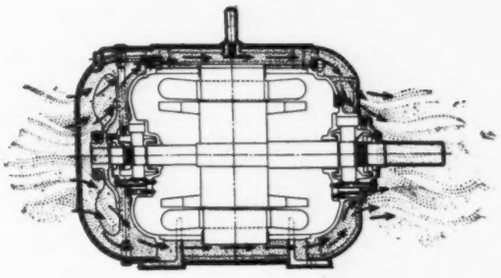

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MOTORS TRANSFORMERS FANS BRAKES

L234-7

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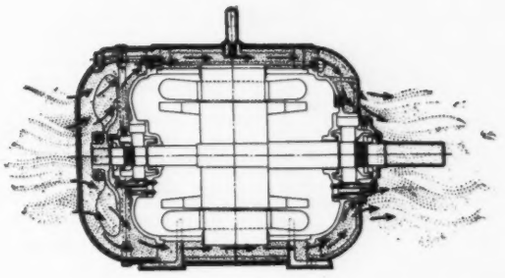

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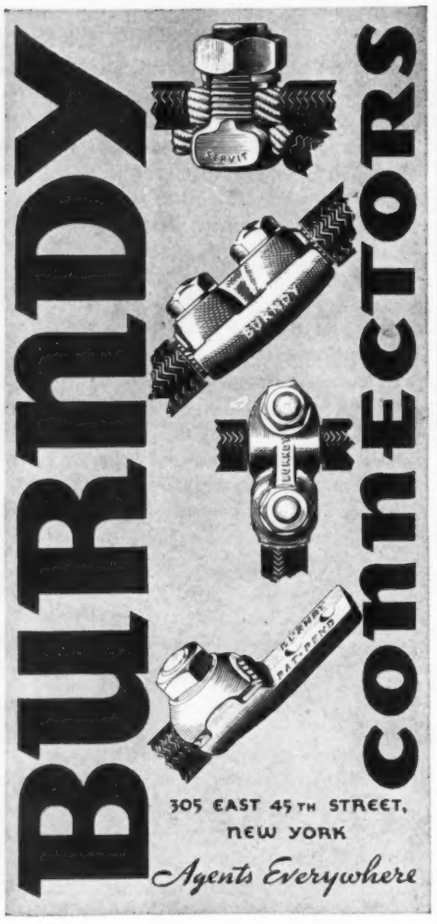

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LETTERS TO THE EDITOR

Inducement Rate Analysis Reveals Surprise

To the Editor of ELECTRICAL WORLD:

The article by R. P. Moore entitled "Consumption Depends Primarily on Price," which appeared in ELECTRICAL WORLD of August 11, on page 186, illustrates a condition about which little has been written. We have heard a great deal about the value of promotional rates in increasing consumption, and yet statistics from widely separated territories with large differences in rate levels show a remarkable uniformity in annual revenue per consumer. I have tabulated the information shown in curve form in Mr. Moore's article and computed the total bill for various consumptions with the surprising result shown in the table at top of next column—that the consumer with an annual use of 2,000 kw.-hr. a year pays a lower bill than consumers with smaller consumptions.

Kw.-Hr. per Year	Cents per Kw.-Hr.	Computed Total Bill	Kw.-Hr. per Year	Cents per Kw.-Hr.	Computed Total Bill
400	9.0	36.00	1,300	2.2	28.60
500	7.1	35.50	1,400	2.0	28.00
600	5.7	34.20	1,500	1.8	27.00
700	4.6	32.20	1,600	1.7	27.20
800	3.8	30.40	1,700	1.6	27.20
900	3.4	30.60	1,800	1.5	27.00
1,000	3.0	30.00	1,900	1.4	26.60
1,100	2.7	29.70	2,000	1.3	26.00
1,200	2.4	28.80			

It would be interesting to learn if any one who has attributed a gradual increase in average use over a period of years to promotional rates has made any particular investigation to be sure that this increase cannot be equally well attributed to greater use of appliances or increased purchasing power. Aside from this question, however, the tabulation illustrates the popular fallacy of supposing that a utility which, due to its particular characteristics, has inherently high costs can build up consumption to equal that of a system of abnormally low costs and still remain in business. In other words, increased use may follow rate reductions, but increased revenue will not, and the utility will find itself faced with the greater cost of supplying a larger number of kilowatt-hours to a consumer for about the same revenue.

J. S. MOULTON
Pacific Gas & Electric Company
San Francisco, Calif.

BOOK REVIEWS

The Power Factor Booklet

By Richard Amberton. Published by the Electrical Apparatus Company, Ltd., Vauxhall Works, South Lambeth Road, London, S.W.8, England. 82 pages, illustrated. Price, 2/6.

After some preliminaries which are fairly orthodox electrical engineering the author launches into a series of fourteen non-electrical analogies for power factor—non-revenue freight tonnage and froth on beer are typical. In general, however, the analogies would serve almost as well to elucidate efficiency as they do power factor. The purist would object to each of them on some ground, but the opportunist might find in them something useful for the credulous customer who will accept an analogy as readily as an apology. The book hardly takes power factor out of the *status quo*.

•

Warming Buildings by Electricity

By Frank C. Smith. Engineers Book Shop, 227 Park Avenue, New York, N. Y. 157 pages, illustrated. Price, $3.50.

Electric heating systems will not have the large margins of capacity that mark ordinary furnace, boiler and radiator installations. It is therefore important to make a much more thorough analysis of the methods of heat impartation, transfer and loss than with prevailing systems if guarantees are to be met with electrical heating. This book does just that in considerable detail. It gives the numerical data to support its quantitative calculations of specific installations. Of course it is based on the Briton's contentment with 60-65 deg. F. in his living rooms. There is little about all-season economics and meeting the peaks of degree-days. There is, however, an extensive treatment of thermal storage systems which iron out the diurnal variations. While the book is nearly "solid meat" on heat computations and installation technique, the price seems unduly high for the length.

•

Five-Place Table of Natural Trigonometric Functions to 100th Degree

Compiled by Amelia De Lella. Published by John Wiley & Sons, Inc., 60 Broadway, Brooklyn, N. Y. Price, $1.

Engineers have expressed a need for five-place trigonometric functions for hundredth degree steps of angle. The author, working with others in the central station engineering department of the General Electric Company, has met this need by collating the fifteen-place sine and ten-place tables published by Briggs in 1633. For work where the customary four-place tables are insufficiently exact this five-place tabulation will be most useful.

Personnel Changes

▸GEORGE SHERRY has been appointed general sales manager of the General Cable Corporation, New York.

▸CHARLES T. DAVIS, president of the Middletown Savings Bank, has been elected president of the Bradley & Hubbard Manufacturing Company, Meriden, Conn. CLAUDE C. OSTROM has been elected general manager and a director.

▸RALPH DEBADI has been appointed sales manager of the Parker Electrical Manufacturing Company, Oakland, Calif.

▸V. G. VAUGHAN, formerly manager of the appliance engineering division of Westinghouse Electric & Manufacturing Company, is now manager of the Spencer Thermostat Company, Attleboro, Mass., in which capacity he has charge of all operations including development of new products. Mr. Vaughan first became identified with Westinghouse as tester.

▸HENRY M. CHASE has retired from the engineering staff of the Worthington Pump & Machinery Corporation, Harrison, N. J., after almost 43 years of continuous service. He entered the engineering department of the Holyoke works of the corporation (then the Deane Steam Pump Company) in 1891, and with the exception of about one year spent with the De La Vergne Manufacturing Company has been continuously identified with Worthington. As chief engineer and consulting engineer, he covered practically the whole line of Holyoke Works products.

▸ROGER W. ANDREWS, until recently assistant to the president of the Blaw-Knox Company, has been appointed western manager of Combustion Engineering Company, Inc. The new division will comprise the Chicago, Detroit, Indianapolis, St. Louis, Kansas City, Houston, Tulsa, Minneapolis and Denver offices. Mr. Andrews' connection with the steam power field dates back to 1910, when he joined the Northern Equipment Company. Four years later he formed the R. W. Andrews Company of Chicago, handling power plant equipment, and in 1915 he joined with Grant D. Bradshaw to form the Andrews-Bradshaw Company with headquarters in Pittsburgh. When in 1928 the Andrews-Bradshaw Company merged with the Blaw-Knox Company as a division of Blaw-Knox, Mr. Andrews became manager of that division. He was later made assistant to the president, in which capacity he spent considerable time in Europe, including Russia, directing the activities of the branch offices and manufacturing plants in England, France, Germany and Italy. He joined Combustion Engineering last month.

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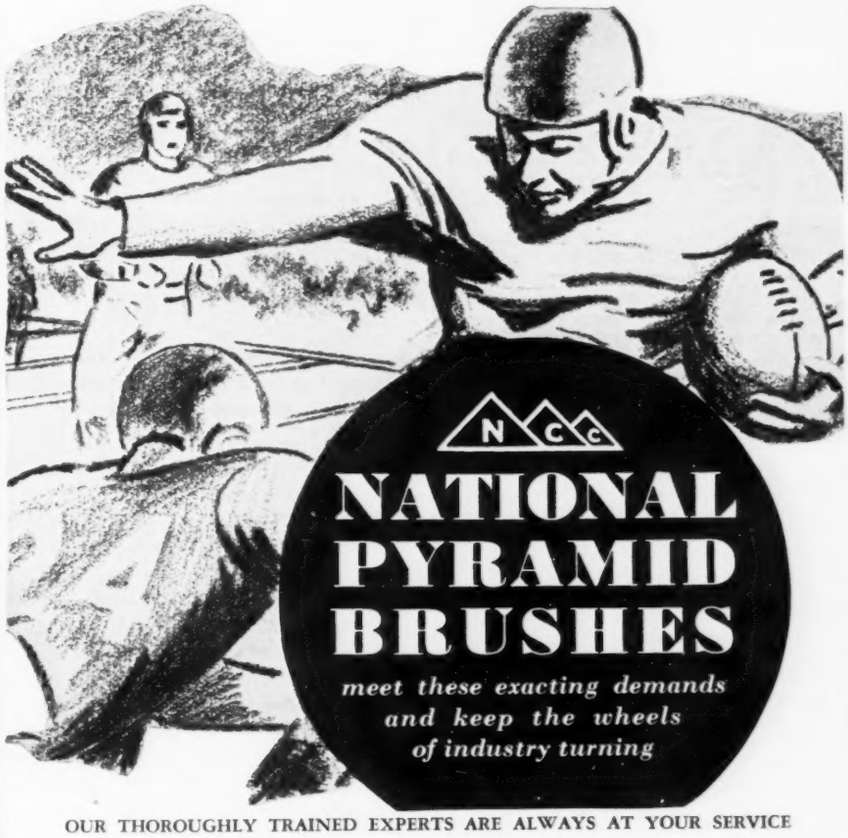
WEIGHT, strength and speed influence the selection of the team from a large squad of candidates, but performance in the game is the final test.

National Pyramid Brushes are selected for specific applications as carefully as the coach picks his team. Performance under the severe demands of service is the final test of quality.



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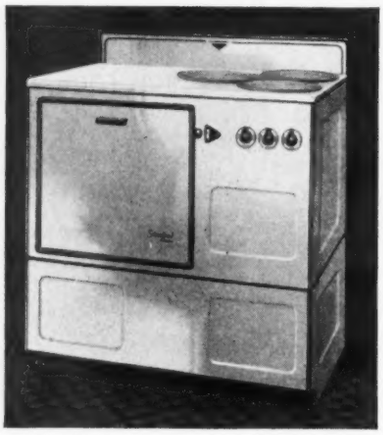

The "Jewel Box": Floor space 34 x 22 inches, 34 inches high. Oven size, 16 x 17½ x 14 inches; indicating temperature control. Three full size open burners or enclosed KAY-67. Six-inch burners may be substituted on order. Cooker interchanges with rear burner extra on order. Oven equipped with broiler pan and sliding bracket rack. Full porcelain enameled in two tone ivory with acid proof cooking top.

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Mass or Class—Standard fits all with its variety of models. They have been installed in the homes of the largest automobile builder, the largest meat packer, the most famous movie couple, many more of the most famous movie stars, the largest producer of films, the largest chewing gum manufacturer, the largest auto body manufacturer, the largest manufacturer of dental supplies, the largest manufacturer of motor wheels, the best known airplane manufacturer, the author of Grand Hotel, and many others.

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The Standard Electric Stove Co., Toledo, Ohio

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Recent Rate Changes

Pennsylvania Public Service Commission has notified fifty utility companies operating in that state to proceed immediately to reduce their rates or furnish the commission with conclusive evidence why rates should not be cut. The companies, the names of which have not been made public, have until November 15 to reply to the order. This action follows the adoption by the commission of a resolution six months ago stating that, during the present economic situation, an annual return of 6 instead of 7 per cent could be allowed companies under its jurisdiction. If any company fails to comply with the commission's request, formal proceedings will be instituted to bring about the result, it was stated.

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California Railroad Commission, upholding the contention that the new winter agricultural rate proposed by the San Joaquin Light & Power Company and the Pacific Gas & Electric Company is discriminatory, denied applications of these utilities to establish the schedule. The proposed rate, lowering the costs of energy for pumping during the winter season, would have eliminated the demand charge, although the energy charge remained the same. In handing down the decision, the commission pointed out that only a few agriculturists would be able to use the new rate and the elimination of the demand charge would favor a limited group at the expense of the remainder of the consumers.

•

Interstate Power Company has made a voluntary reduction in commercial lighting rates in Dubuque, effective October 1 last, and has announced that another reduction in the same rates will be made on April 1, 1935. The two reductions will represent a saving of $25,000 to users of commercial lighting.

•

Public Service Company of Colorado's rate case was carried to the district court in Denver recently when a group of consumers who are seeking the rate reduction applied for an order for the Colorado Public Utilities Commission to certify and submit for judicial review all records in the case in which the commission had dismissed petition for the rate investigation. Judge Henley A. Calvert issued the order. The petition for the court order stated that a complaint was filed with the commission on August 8 asking a hearing on reasonableness of electric and gas rates in Denver. On August 20 the company filed with the commission a motion to dismiss the case, claiming the sole jurisdiction for regulation of its rates to local consumers is vested in the city and county of Denver. The commission dismissed the complaint on September 13 and denied a rehearing on September 20.

Northern Pennsylvania Power Company has filed new electric rates to become effective November 15, making reductions of approximately $100,000 a year, in certain of the company's domestic, commercial and power rate schedules. The company is not one of those requested by the state Public Service Commission to show why they should not reduce their rates.

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Minnesota Railroad and Warehouse Commission will be given authority to regulate and supervise rates charged and securities issued by Minnesota public utilities and to set up a new valuation system if legislation now being framed for presentation at the next session of the state Legislature is passed. It is proposed to fix the value of each corporation as of July 1 next.

•

Bronx Gas & Electric Company has been ordered by the New York Public Service Commission to cut its electric rates 20 per cent, effective November 1. The new lower rates are temporary, to remain in effect until permanent rates are fixed by the commission. In discussing the reduction, Chairman Milo R. Maltbie pointed out that for the year ended August 31, 1934, the latest yearly period available, the company's own figures showed a profit of $431,800 in excess of a 6 per cent return on its investment. Chairman Maltbie pointed out also that a 20 per cent cut in rates would mean a reduction of $520,000.

Equipment for Better Seeing

[*Continued from page 36*]

tensities with some of the newer spot lamps, based on distribution curves and separation from work, have recently been prepared.

Spot lamps are produced by a number of manufacturers in different styles: Small deep-bowl aluminum reflectors; porcelain enameled deep-bowl reflectors; mirrored-glass spotlight; aluminum spotlight with louvers; mirrored-glass floodlight (medium beam); small portable floodlights with cover glass; chromium-plated floodlight with cover glass; enameled-steel angle reflectors, and ceiling lenses. Intensities of 60 to 180 foot-candles can be produced on the work by single units depending on type and distance. Various methods of mounting are available—ceiling mount and bracket arms (floor pedestal and wall or machine attachment).

This is but a birdseye view of developments. The equipment is available to light for more profits, greater comfort and enhanced beauty.

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LEGAL NOTICE

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF MARCH 3, 1933

Of Electrical World, published every other Saturday at New York, N. Y., for Oct. 1, 1934.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared B. R. Putnam, who, having been duly sworn according to law, deposes and says that he is the Secretary of the McGraw-Hill Publishing Company, Inc., publishers of Electrical World, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, McGraw-Hill Publishing Company, Inc., 330 West 42d Street, N. Y. C. Editor, L. W. W. Morrow, 330 West 42d Street, N. Y. C. Managing Editor, None. Business Manager, James H. Rudd, 330 West 42d Street, N. Y. C.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.) McGraw-Hill Publishing Company, Inc., 330 West 42d St., N. Y. C. Stockholders of which are: James H. McGraw, 330 West 42d St., N. Y. C. James H. McGraw, Jr., 330 West 42d St., N. Y. C. James H. McGraw, James H. McGraw, Jr., and Malcolm Muir, 330 West 42d St., N. Y. C., Trustees for: Harold W. McGraw, James H. McGraw, Jr., Donald C. McGraw, Curtis W. McGraw. Curtis W. McGraw, 330 West 42d St., N. Y. C. Donald C. McGraw, 330 West 42d St., N. Y. C. Anne Hugus Britton, 330 West 42d St., N. Y. C. Mason Britton, 330 West 42d St., N. Y. C. Edgar Kobak, 330 West 42d St., N. Y. C. Grace W. Mehren, 33 West Grand Ave., Chicago, Ill. J. Malcolm Muir and Guaranty Trust Co. of New York, Trustees for Lida Kelly Muir, 524 Fifth Ave., N. Y. C. F. S. Weatherby, 271 Clinton Road, Brookline, Mass. Midwood Corporation, Madison, N. J. Stockholders of which are: Edwin S. Wilsey, Madison, N. J. Elsa M. Wilsey, Madison, N. J.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: (If there are none, so state.) None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the months preceding the date shown above is. (This information is required from daily publications only.)

B. R. PUTNAM, Secretary.

McGRAW-HILL PUBLISHING COMPANY, INC.

Sworn to and subscribed before me this 28th day of September, 1934.

[SEAL] H. E. BEIRNE,

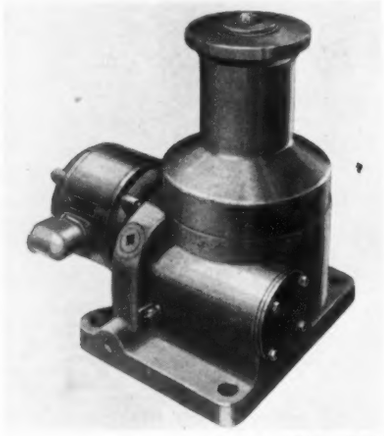
Notary Public, Nassau County. Clk's No. 66, N. Y. Clk's No. 118. Reg. No. 6-B-73.

(My commission expires March 30, 1936)

NEW EQUIPMENT

Motorized Car Spotter

Link-Belt Company, Chicago, announces that its vertical-capstan electric car spotter will hereafter be furnished with the motor attached to side of spotter housing; no motor shaft coupling or separate motor base plate will be required. Proper initial and permanent alignment



Link Belt

of motor shaft is assured and the plan measurements of foundation required are a minimum. The helical-gear reduction and worm-gear run in oil. The motor can be removed as a unit complete with motor pinion, without disturbing the rest of the machine.

The Link-Belt motorized spotter, like its predecessor, is available in two sizes. The smaller machine has a rope pull of 5,000 lb. and the larger size 10,000 lb. An Eight-page illustrated book, No. 1392, covers this new product and will be sent to any one requesting a copy of it on business letterhead.

•

Oil and Grease Seal

Oil and grease seal known as the type BB, for application to all types of machinery embodying shafts, has been announced by the National Motor Bearing Company, Oakland, Cal. It completely excludes extraneous matter and provides positive imprisonment of oil, grease and fluids, it is claimed. The seal consists of an outer steel case which locks the seal assembly permanently. The outer case has a press-fit accuracy of 0.002-in. tolerance. An equalizing annular garter spring within the case provides a uniform continuous contact, pressing against the sealing member at all points circumferentially.

The actual sealing member contacting the moving shaft is made of various materials, usually a processed leather, to suit different conditions such as temperature, peripheral speeds, unbalanced pressures and chemical activity. It eliminates the necessity of stuffing boxes, labyrinths and other baffling means.

•

Neon Discharge Tubes

"Tattelites," which are a line of neon discharge tubes having breakdown potentials of 100, 250, 500, 1,000 and 2,000 volts, have been announced by the Littlefuse Laboratories, Chicago, Ill. They are really "voltage" fuses, protecting equipment against excessive voltages, whereas regular fuses protect against excessive currents. They operate by shunting out the overload. They prevent insulation breakdowns, protect voltmeters, ammeters, transformers, condensers and gaseous rectifiers against voltage surges, make good radio lightning arresters, leak-off static charges from machinery, etc., it is claimed.

Tattelites glow brilliantly when operated. The life range is from 1,000 to 5,000 hours of continuous duty, depending upon the type and size of tube. They are rated at the nominal voltage at which the discharge occurs between the primary electrodes. The recommended maximum currents are those the Tattelites will carry without exceeding normal temperatures. Tattelites have a negative resistance coefficient; that is, the higher the current the lower the resistance, the voltage drop across the tube changing only very slightly. It

Littlefuse Laboratories

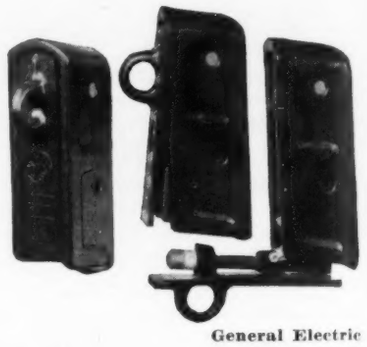
is for this reason a limiting resistor is needed. While they may be overloaded as much as 1,000 per cent momentarily, prolonged overloading may permanently change the characteristics of the tube. The maximum load on a.c. is approximately double that given for d.c.

•

A new HAND-TYPE COMMUTATOR MICA SLOTTER is announced by Ideal Commutator Dresser Company, 1005 Park Avenue, Sycamore, Ill. The tool is swiveled to enable cutting at the proper angle in close quarters.

Inclosed Indicating and Drop-Out Fuse Cutout

Porcelain-inclosed cutouts, which give positive evidence that the circuit is open either by the conventional drop-out method or by a new method which affords visual indication of a blown fuse link by partially opening the door of the cutout at the lower end, have been announced by the General Electric Company. Since the new indicating feature allows the bottom of the door to protrude only about 1¼ in. when the fuse link is blown, the live contacts and



General Electric

mechanism are not exposed to the weather.

Rated at 5,000 volts, 60 amp., with an interrupting capacity of 1,500 amp., r.m.s., these cutouts are easily convertible from the new indicating action to drop-out action merely by removing, with the fingers, a small wire yoke from the mechanism. When the device is employed as a conventional drop-out cutout a time-delay feature, provided by a spring-latching mechanism, causes the current to be broken in the fuse holder before the contacts open, thus assuring freedom from burned contacts and possible destruction of the cutout.

A spring-driven lever arm to which the fuse link is fastened pulls even the largest sizes of fuse links out of the fuse holder when the currents are too small to produce expulsion action.

•

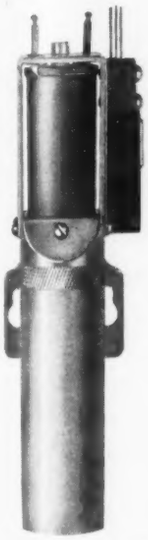
New features of the LAMP HANGER of the Thompson Electric Company, 1101 Power Avenue N.E., Cleveland, are the availability of a swivel for angular mounting and demountable porcelain bushings.

ELECTRIC TORCH MANUFACTURING COMPANY, Oakland, Cal., announces a Roffy automatic arc torch for mechanics' use in welding, brazing and hard surfacing. It may be used as single or

double electrode and operates off a 110-volt, 30-amp. lighting circuit. Starting is automatic and thereafter impedance and a nichrome ballast function to hold the arc at stable temperature.

•

Delayed-Action Relay



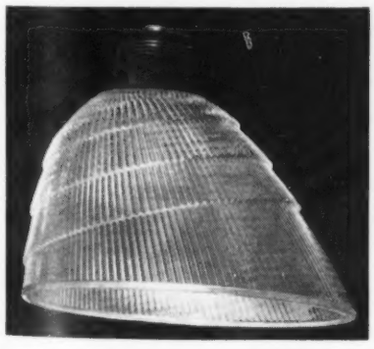
Automatic Electric

A delayed-action relay which operates on alternating current without requiring a series condenser in its circuit has been announced by the Automatic Electric Company, Chicago. It is of the oil-dashpot type, similar to the direct-current relay of the same series. The time-delay interval between the closing of the coil circuit and the operation of the contacts can be varied from 5 seconds to 1½ minutes by merely turning the outer dashpot cylinder. Release time of the relay is 0.010 second and is non-adjustable. This relay can be furnished to operate on various voltages and frequencies and can be provided with a variety of contact combinations.

•

Show Window Reflectors

For flush mounting in the false ceiling of a show window a new Holophane window reflector of 200-watt design has



Holophane

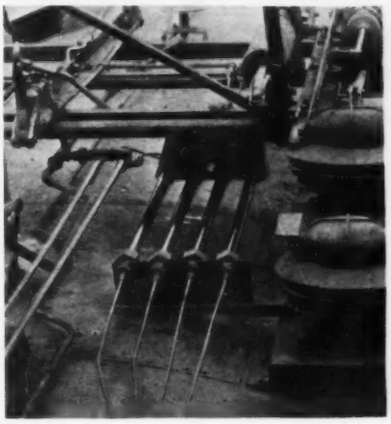
been announced. Units are complete with a variety of holder types, finishing rings and plaster rings and can be placed on 13-in. centers. They have been placed on the market by the Holophane Company, Inc.

•

The MULTI-POINT RECORDER for gas and air temperatures is now made with multi-color record by Leeds & Northrup, 1401 Stenton Avenue, Philadelphia, to distinguish better between groups of indications.

Air-Line Insulators

For use on pantographs between cab controls and cylinders an air-line insulator has been announced by the West-



Westinghouse

inghouse Electric & Manufacturing Company. It consists of a sturdy porcelain tube with the necessary steel end-fittings and is suitable for equipment operating up to 11,000 volts. A rubber bushing assures an airtight connection between the porcelain and the aluminum alloy connector.

•

Roof-Entrance Bushings of Improved Design

General Electric

Improved design for the roof-entrance bushings used with outdoor switchhouses was adopted recently by General Electric's Switchgear Sales Division, Philadelphia, Pa. This design prevents the collection of water inside the bushing around the stud, with the attendant danger of freezing in cold weather, for the stud is threaded and sweated into the cast termial at the top of the insulator and can be removed from the porcelain only from the top. Available in ratings 400, 600 and 1,200 amp. at 7,500 and 15,000 volts, these bushings are of the same over-all dimensions as the old ones and are therefore entirely interchangeable with them.

•

A DRY DEVELOPING PROCESS which makes positive prints in one operation is announced by Ozalid Corporation, 354 Fourth Avenue, New York. Average power consumption is 900 watts, to give working temperature of 180 deg. F.

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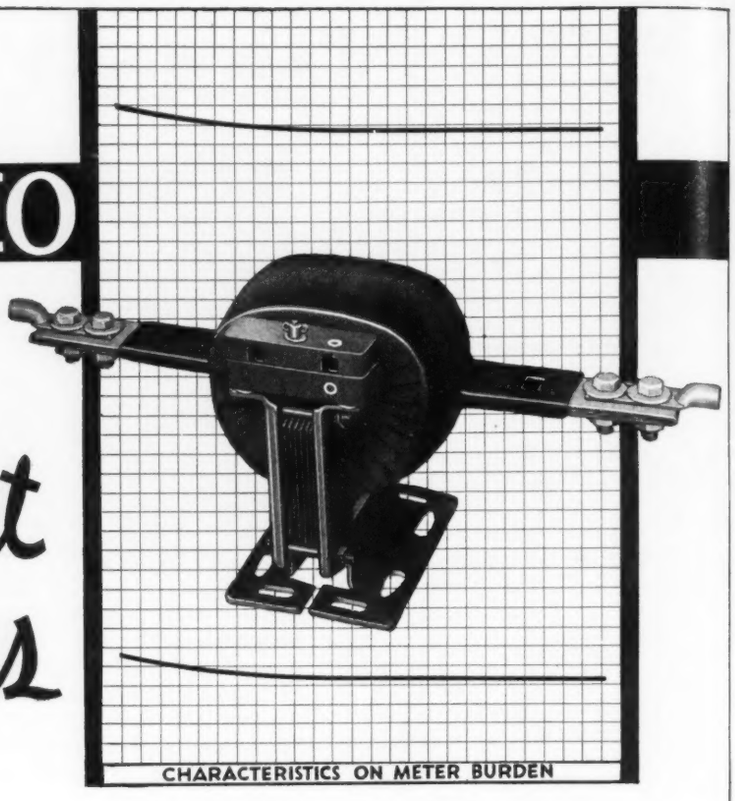
SANGAMO

Instrument transformers for

ACCURATE METERING



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Ratio and phase angle characteristics of instrument transformers are important factors in accurate metering. . . . .

Through scientific design and the use of special alloys, the characteristics of Sangamo instrument transformers have been developed to meet the most exacting requirements. Both current and potential transformers are supplied in several types to provide for any indoor meter installation.

Sangamo instrument transformers have kept pace with the improvements made in watt-hour meters. The combination represents a contribution to the art of electrical measurement. . . . . .

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In Upsetting Valves——

Accurate Control of Preheating by EC&M AUTOMATIC WELD TIMER has practically eliminated rejects—

The EC&M Automatic Weld Timer used on Spot, Butt and Projection Welding Machines has found a new use. A large and prominent manufacturer of engine valves has recently installed one of these Timers to insure that the correct number of heat units are put into the rod before the upsetting motion to form the head of the valve is started.

Since installing the EC&M Timer, there have been practically no rejections. In a recent run of 40,000, there was not a single rejection while previously in a run of this size, the number of burned or bent valves (caused by too much or too little preheating) would average about 800. Let us send you complete information on the EC&M Automatic Weld Timer.

NEW DESIGN TIMER — **The Folio 2 EC&M Automatic Weld Timer is now available. It contains less apparatus, is smaller and is much faster in operation than its predecessor. If you have a problem similar to the above, send us the facts. For welding applications, use the convenient coupon below.**

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THE ELECTRIC CONTROLLER & MFG. CO. E.W. 10-34
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Gentlemen:
Please send your complete literature describing the NEW DESIGN EC&M Automatic Weld Timer for use with a . . . KVA Welder.
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SALES OPPORTUNITIES IN NEW CONSTRUCTION

Spot coverage of new work. Projects approved and proposed, bids requested, equipment wanted, funds available. Prospects for the electrical manufacturer.

SELLERS, S. C.—Carolina Power & Light Company, Raleigh, N. C., will build new transmission line from Marion to Sellers, about 10 miles, for electric light and power service in latter district. Project has been authorized by South Carolina State Railroad Commission.

NEW YORK, N. Y.—General Foods Corporation plans installation of motors and controls, conveyors, etc., in connection with extensions and improvements in plants in different parts of country. Cost about $300,000.

TWO HARBORS, MINN.—Plans new power transmission line, about 35 miles, for electric light and power service for city. Estimates of cost have been ordered. Rudolph Erickson, city electrical engineer, in charge.

ALEXANDRIA, LA.—Plans extensions and improvements in city-owned electric light and power plant, including installation of new prime movers and auxiliary equipment. Cost about $250,000. Financing is being arranged.

ST. JOSEPH, MICH.—Nineteen Hundred Corporation, Binghamton, N. Y., plans installation of motors and controls, conveyors, etc., in proposed additions to washing machine manufacturing plants at St. Joseph and Binghamton, including improvements in present factories. Cost about $100,000.

DEVILS LAKE, N. D.—Has plans nearing completion for city-owned electric light and power plant and proposes early construction and purchase of equipment. Cost about $300,000. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

CLEVELAND, OHIO—Lincoln Electric Company has filed plans for new two-story addition to plant, 180x187 feet, and begins superstructure at once. Cost about $100,000, with equipment.

DETROIT, MICH.—Bohn Aluminum & Brass Corporation plans installation of motors and controls, regulators, conveyors, electric hoists, etc., in proposed new sheet and wire aluminum mills. Expected to begin work early in coming year. Cost over $5,000,000, with machinery.

LA PLATA, MO.—Plans early call for bids for city-owned electric light and power plant, using Diesel engine-generator units, and electrical distribution system. Fund of $100,000 has been arranged. E. T. Archer & Company, New England Building, Kansas City, Mo., are consulting engineers.

WINSTON-SALEM, N. C.—Commissioner of Public Works plans installation of motors and controls, conveyors, electric refrigerating machinery, etc., in new city-owned abattoir, for which bids will be asked in November. Harold Macklin, Reynolds Building, is architect.

WAUKEGAN, ILL.—Alexian Brothers Hospital has plans under way for new electric light and power plant for service at institution, and will ask bids for equipment early next year. Cost over $350,000, with distribution lines and facilities. Maher & McGraw, 1564 Sherman Avenue, Evanston, Ill., are architects.

MURRAY, UTAH—Has called special election to approve bonds for $33,000 for extensions and improvements in city-owned electric light and power plant, and plans early call for bids for equipment.

GRAND RAPIDS, MICH.—Leonard Refrigerator Company plans installation of motors and controls, conveyors, heat-treatment equipment, etc., for expansion and improvements in porcelain enameling plant. Cost over $100,000. Company is a subsidiary of Kelvinator Corporation, Detroit.

WASHINGTON, D. C.—Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until November 2 for motor-generator sets, controllers and spare parts for Brooklyn, N. Y., Philadelphia, Pa., and Charleston, S. C., navy yards (Schedule 3574).

WOODBURY, N. J.—Plans complete electrification of waterworks pumping and power station, with installation of new equipment. Fund of $50,000 has been arranged through Federal aid. F. F. Kaufman, 909 Pine Street, Camden, N. J., is consulting engineer.

SEATTLE, WASH.—Board of Public Works, J. D. Ross, superintendent, city lighting department, asks bids until November 8 for control and instrument switchboards, frequency and load control equipment for city-owned Diablo hydroelectrical power plant.

CLARKSBURG, CALIF.—Amalgamated Sugar Company, Ogden, Utah, plans installation of power substation equipment, motors and controls, regulators, conveyors, loaders and other equipment in proposed new beet sugar mill on 75-acre tract of land near Clarksburg. Group of 15 buildings will be erected, including power house for processing power service. Cost over $1,000,000. A. J. Forbes is chief engineer.

SUTHERLAND, NEB.—North Platte Valley Public Power & Irrigation District, North Platte, Neb., Donald D. Price, chief engineer and business manager, asks bids until November 1 for seven radial gates, seven skimmer weir gates, and four roller bearing gates with frames, guides and operating machinery complete, for irrigation and hydroelectric power project near Sutherland. Plans are under way for hydroelectric generating plant and transmission system. Fund of $7,500,000 has been secured through Federal aid. Parsons, Klapp, Brinckerhoff & Douglas, 142 Maiden Lane, New York, N. Y., are consulting engineers.

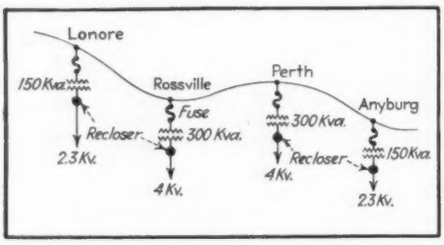
GRAND COULEE, WASH.—Mason-Walsh-Atkinson-Kier Company, Spokane, Wash., contractor for new Grand Coulee dam and hydroelectric power plant on Columbia River for Federal Government, has closed contract with Washington Water Power Company, Spokane, for power supply for construction service, calling for minimum payment of $400,000 over period of 40 months, with extra cost for additional power over minimum. First noted company has contracted with H. H. Walker, Inc., and Fritz Ziebarth, 1323 Venice Boulevard, Los Angeles, Calif., for construction of new 110,000-volt transmission line from Coulee City, where connection will be made with Chelan, Wash., system of Washington company to dam site, about 31 miles. Cost approximately $100,000. A power substation, switching station and distribution lines will be built at last noted point by Mason-Walsh-Atkinson-Kier Company.

Oil Recloser for Distribution

[*Continued from page 25*]

the items of co-ordination to be considered in the circuit diagram are:

1. Because of the rapid clearing characteristics of the recloser any fault beyond the point *A* would be cleared before the time relays at the substation trip the substation oil circuit breaker.
2. The transformer fuses on the branch circuits beyond the point of application of the recloser may be divided into two classes:
(a) Those fuses which, with the short-circuit currents prevalent, are small enough to blow either before the recloser trips or before it locks open after it has tripped.
(b) Those fuses selected to protect the larger sizes of transformers and which, with the short-circuit currents prevalent, will not blow in the time required for the recloser to clear a fault beyond the fuse.

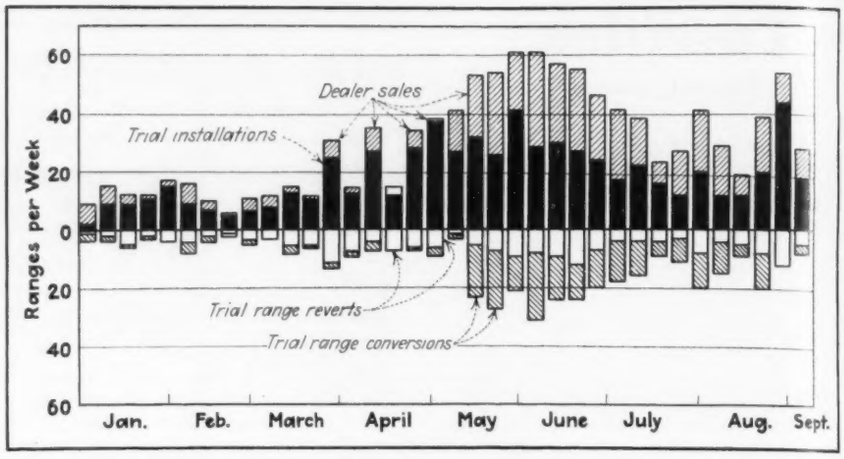


Transformer burn-outs prevented

Reclosers in the secondary of distribution substation transformers feeding communities prevent transformer burn-outs. Faults are interrupted and service quickly restored in districts difficult of access during the winter, with obvious economical improvement in service. Interruption of service only in case of persistent faults.

In item 2, case (a), the performance is in accordance with the regular established practice. Case (b) of item 2 might be considered as an improper application of the recloser, but careful consideration of expected operating results indicates that a material betterment of service can be expected in the majority of cases. This conclusion is drawn on the basis that fuses on transformers blow many times when the transformer is still undamaged and serviceable. Actual statistics show from three to ten times as many blown fuses as transformer failures. Therefore, if the recloser clears before the fuse blows the fault will, in many cases, be cleared without blowing the transformer fuse. This is considered an advantage. Furthermore, the recloser would, in addition, be giving reclosing service protection against transitory line faults.

The oil circuit recloser was developed principally for application where low cost was a necessity. Therefore some of the features, adjustments and refinements in operation and application of larger and more expensive devices are not included.



Trial ranges maintain popularity while conversions to owned units continue

Range Dealers and Utility Work Together at Hartford

Steady progress in electric range business is benefiting both the local utility and dealers at Hartford, Conn., this year, and there were 5,381 electric range installations in service on the Hartford Electric Light Company system on September 15. This represents a saturation of about 10 per cent among residential customers; not as large as in some Western communities, to be sure, but a gratifying increase over earlier conditions. About 50 per cent of the company's employees now cook electrically. The trial installation plan of the company previously described in the ELECTRICAL WORLD is making excellent headway, as chart above indicates. Dealer sales bear a good proportion of added ranges, as graphed up to September 8.

Recently the company has begun to try out a plan of encouraging trial installations by waiving the cost of wiring in exchange for an old cooking stove of whatever type and make. This offer was not advertised in the local papers, but was made known verbally to prospective range customers by company representatives, and in the first four days 32 installations were ordered, as against sixteen in the entire week before. The week-to-week results show a rather gratifying number of conversions from the trial ranges to improved customer-owned equipment since early spring, and the number of reverted trial ranges is not large in proportion to the total new installations provided.

P.G.E. TIES IN WITH BETTER HOUSING PROGRAM

The window poster used in conjunction with this domestic display says: "¶Today the whole country is engaged in a great movement to modernize its homes, to safeguard its property investment and to maintain American high standards of living. ¶The Better Housing Program of the National Housing Act has made it possible to borrow the necessary funds for home modernization on the most reasonable terms ever offered in the history of finance. ¶You may have deferred the purchase of house heating equipment, an automatic water heater or eye-saving lighting fixtures. You need no longer deprive your family of these modern appliances. Let Uncle Sam help you. Ask for information."

Optimism Sweeps N.E.M.A.

[*Continued from page 23*]

The multitude of operations now going on under the code were well presented in the report of the board of governors. A study of wages and employment affected by the code showed 222,000 employees in May, 1933, and this increased to 318,000 in November. The payroll increased from $245,000,000 in May, 1933, to $350,000,000 in November. Statistics on sales showed $272,000,000 for the second half of 1932, $268,000,000 for the first half of 1933 and $359,000,000 for the second half of 1933. An interesting note is found showing that, as of August 1, 1934, there were 126 open price filings in operation.

At the present time the compliance division has outstanding only 48 unadjusted complaints, most of them of recent origin. It has handled 434 complaints during the year. The annual report of N.E.M.A. gives full evidence that the electrical manufacturers are well organized and operating effectively under the code.

Swope on 30-hour week

An important analysis of the fallacies in the proposed 30-hour week was given by Gerard Swope. He said that saddling all industry with a 30-hour week is an "utter impracticability." Such a program would defeat its own objects of more employment and better living standards. He said:

"The only way, it seems to me, that a decrease in hours and increase in wage rate can be accomplished is by new inventions and better methods, so that lower costs will be arrived at, which lower costs may be quite consistent with higher earnings per week for those employed. Such lower costs will be reflected in lower selling prices, which will tend toward a greater consumption, better standards of living and maintaining our increased employment."

This clear analysis and logical exposition received applause.

The experiences of the insurance groups in developing organization and ethical rules were cited by J. A. Stevenson. He pointed out that the NRA had created new conditions and new requirements for management. One of the most necessary functions is to train and educate employees.

The presentation of the McGraw award to J. S. Tritle for contributing most to constructive developments in

R&I.E. *Live Line*

INSULATOR TESTER

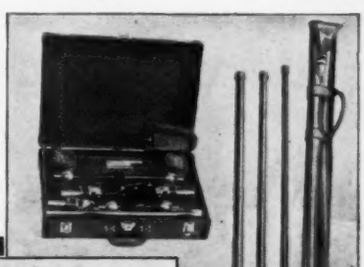
• *is* •

EASY TO USE » » FOOL-PROOF AND ABSOLUTELY SAFE

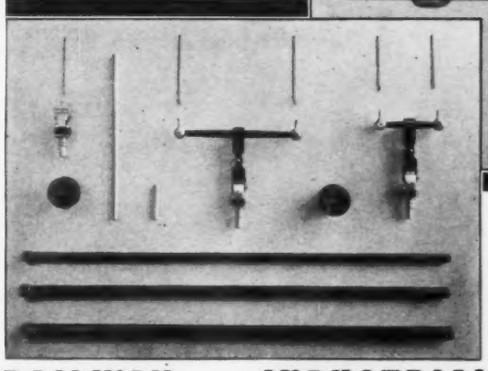
YOU can't tell the exact condition of any unit of a stack or strain unless you TEST it with a reliable tester. When the unit is defective you can then remove it.

Here is what the R. & I. E. Tester means to your property. It saves you trouble and expense.

- Eliminates annoying radio interference.
- Helps guarantee continuity of service.
- Removes only defective insulator units.
- Records rate of deterioration of each unit.
- Shows type of insulators best suited for your system.
- Improves customer goodwill and maintains revenue.
- Reduces maintenance costs by finding the cause of failure before it happens.



Above—Insulators are tested by making use of the operating voltage to produce a visible deflection of an instrument needle, such deflection indicating the condition of the insulator under test.



Left—Handle and instruments in compact carrying cases. They are mechanically rugged yet simple in construction and light enough in weight to be easily handled under all conditions.

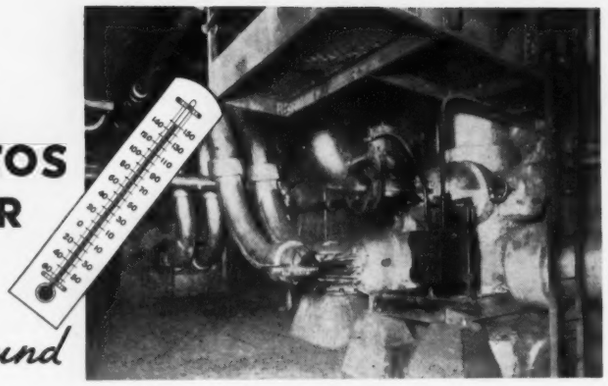
Left—The Insulator Tester complete is provided with three different heads to fit all of the wide variety of insulators which may be encountered. For special conditions where possibly only one or two types of insulators are to be tested, only one head may be needed.

RAILWAY AND INDUSTRIAL ENGINEERING CO.

GREENSBURG, PA.

NEW YORK BOSTON PHILADELPHIA PITTSBURGH CHICAGO ST. LOUIS BUFFALO BIRMINGHAM DENVER INDIANAPOLIS KANSAS CITY HOUSTON LOS ANGELES PHOENIX SAN FRANCISCO SEATTLE TORONTO SUMMERVILLE, S. C.

ROCKBESTOS WEATHER *Here the year 'round*



The 150° temperature in this steam valve control room is hard on equipment as well as people. You can no more expect ordinary wire to stand up under this excessive heat and moisture without going to pieces than you can expect human beings to.

But fortunately you can guard against such failures by installing an insulated wire or cable on which high temperatures have no effect—ROCKBESTOS. All ROCKBESTOS A.V.C. wires are designed to operate successfully under severe operating conditions of which the moisture laden heat of this control room is typical. The basis of the insulation of ROCKBESTOS A.V.C. wire is a felted and impregnated wall of million-year-old asbestos. A varnished cambric insert embedded in this wall gives an extra safety margin under wet conditions and a tough, highly polished asbestos jacket makes it possible to pull A.V.C. wire in conduit just like any other type of wire.

ROCKBESTOS A.V.C. wires and cables are genuinely heat-proof because they don't become hard and brittle under continuous high temperatures, they are unaffected by corrosive fumes and they won't bloom when exposed to oil or grease.

Power companies, railroads, steel mills, mines and industrial plants of all sorts are using more ROCKBESTOS every year, not only in hot spots but wherever wiring is attacked by other types of severe conditions. Once installed ROCKBESTOS wires never need replacement which makes for both economy and reliability even under the most trying conditions.

Try the ROCKBESTOS recipe for beating high temperatures. ROCKBESTOS PRODUCTS CORPORATION, New Haven, Conn.

ROCKBESTOS
—the wire with permanent insulation

TIREX
SHOVEL CABLE

keeps those tough jobs GOING

TIREX Shovel Cables make their best showing under severe working conditions. In quarries, strip mines and wherever shovels must operate TIREX Cables can be depended upon to do their part in providing economical operation.

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge A Boston, Mass.

electrical manufacturing was heartily applauded. His long and able efforts during the period of code development and operation well deserved the thanks and commendation of his associates. The judges were unanimous and eager that the award be given to Mr. Tritle.

Encouraging outlook

To succeed Mr. Tritle as president is F. C. Jones, president of the Okonite Company. He also is encouraged by the present favorable conditions, particularly with respect to NRA.

"The electrical manufacturing industry is very confident that the establishment of the new National Industrial Recovery Board means more and better self-government for industry," said Mr. Jones. "There is very satisfactory evidence that the considered policies of the new recovery board, together with the reorganized Recovery Administration, will afford industry a satisfactory means of solving its own problems in a manner consistent with policy."

To industry it seems apparent that recovery in terms of employment is dependent upon expansion of industry, which in turn depends upon the confidence that industry may go ahead with prospects of fair profit. This seems essential for normal recovery of the durable goods industries. There seems to be definite evidence that the Recovery Board policy is clearly sympathetic to this point of view.

"One quite necessary condition for effective government partnership with industry for industrial self-government," said Mr. Jones, "is that industry shall push forward its program of organizing industry completely for consideration of its problems. The National Electrical Manufacturers Association, with 175 product groups, compared with 58 a year ago, is planning during the next few months to add substantially to its membership in all product groups, so that every section of the industry may realize the utmost in the educational values which lie in organization for partnership with the government in industrial self-government."

Announcement was made of the election of new members of the board of governors and the re-election of others. The general impression gained from all sides was very encouraging. Business is expected to increase, the code operations are well in hand and the spirit of co-operation is at a peak. N.E.M.A. is almost a model for a self-governed industry.